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Some aspects of a 1970-model planning, control, and information system

Gordon L. Murray

Some Aspects of a 1970-Model Planning, Control, and Information System

by Gordon L. Murray
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In reviewing North American Aviation's annual report I noted that the Chairman's letter in discussing market development effort stated that "... the company is studying the use of information systems to handle the masses of data needed in government and in a number of professions...." At another point it was reported that "the company is studying development of a large-scale, very low-cost electronic data file capable of storing two billion bits of information, which could find widespread use for rapid data retrieval in the financial, medical, legal, and educational professions." I am also not unaware that a segment of the company is called the Space and *Information Systems* Division (emphasis added).

That I would choose a subject concerning information systems to discuss before a group in the information business may seem presumptuous—and perhaps it is. I must say that I got no comfort from seeing references to your commitment to information technology in the annual report. Where I did get some small comfort, though, was from another passage in the report, which said: "The company continued to institute advanced management controls and new techniques in program administration and to streamline operations and organization." Why would advanced management controls continue to be instituted? There must be some degree of dissatisfaction with what exists and a recognition that improvements can be made. Perhaps, I thought, here is a situation a little bit like the barber's son who needs shearing and the shoemaker's son who needs shoeing—there just might be some opportunity for improvement, after all.

In any event, I chose "A 1970-Model Planning, Control, and Information System" as my subject. This is a nice "loose" title, don't you think? The sort of title you get from someone who is asked for his subject before he has prepared his material and determines what it is he is actually going to say. Another thing you might expect from someone asked to provide a synopsis of his subject before he really has a subject is an ambitious statement of what he expects to do. My reply to your

Mr. Hill included a careless remark about "particularizing the points and illustrations to the extent practicable to the characteristics of North American's operations." Fortunately I had included the words "to the extent practicable" in this phrase, so I will hang my hat on that and say that this proved practicable only to a limited extent.

I learned a long time ago, from my type of work, the hazards of pretending to have solutions before you have facts. I will never know why I overlooked this point this time, because I really don't have a very broad or deep set of facts on the specifics of your operations. While I could have learned more about this from my associates serving your company, to supplement what I already know generally about your type of business, this would still not have qualified me to present anything approaching specific answers to problems that may in fact exist.

The consultant providing professional-level services finds that he develops a philosophy concerning a matter and an approach that may have some degree of general applicability; he then disciplines himself to stop at that point. To go further would be to package a solution and go looking for clients willing to pay a fee for it whether it fitted their problem or not. Effective solutions depend on well-defined problems.

So let us agree that you know more about your business and its problems than I do, and let's hope that I offer some philosophy and an approach that will be helpful to you as you search for better answers to those problems.

EVOLUTION OF MANAGEMENT INFORMATION SYSTEMS

The type and scale of management information systems being built today for the 1970s are the product of a process of evolution going back a long time. Some people seem to think that management information systems and the computer are almost synonymous, but management had information and informational needs before it had a computer. The computer made the information problem easier to solve and opened up new possibilities that were previously not practicable to achieve, but at the same time the computer imposes some concomitant problems of its own.

The 1950 Model

My first significant involvement in information systems was back in 1949 and 1950 when I spent almost two years on a consulting assignment

for a company just over the hills from here—an airframe manufacturer, if you can remember what that was.

The term "management information system" had not yet been coined, and the objective of this assignment was simply to develop improved management control reporting practices. This company had just undergone an organization study, and there was need to realign reporting practices to coincide with revisions in the delegation of authority and responsibility. There were no computers aboard, but they did have several punched card tabulating installations, a lot of desk calculators, slide rules, and quantities of lead pencils and tablets.

What did we do in 1950? First we collected all the reports produced in the company on all subject matters—financial, cost, schedule, quality, personnel, and the like. Interviews were conducted of preparers of reports and users to gain an understanding of report content and uses made by those receiving such information. This part was relatively easy, the difficult part being to find a means for evaluating these reports once the findings were in.

One way, of course, is to pull the file on each report, review the report and the interview notes, and merely accept the report as responsive to a need, eliminate it, or modify it in some respect. While I have seen this procedure applied, it has real limitations, for you are only considering what you see within the four corners and two sides of the report form. As we considered this problem we concluded that what was needed was a structure in which any single report could be slotted and then evaluated in terms of its purpose and in comparison with other reports or new types of reports that could be developed.

What kind of structure were we thinking about? Exhibit 1, in the material you have been given, is a reproduction of one section of the structure we developed. This covered the Manufacturing Branch. Down the left side are shown various control areas—those areas of operations that needed to be controlled to assure effective over-all results—quality, cost, schedule, personnel, facilities, inventories, work load, research, profit and financial factors. The body of the exhibit indicates the type of information considered appropriate for control purposes, positioned in columns for each key manufacturing branch executive.

Compared with what we do today, this is a crude definition of requirements, but this was 1950. Even though it was crude, it extended our ability to evaluate reports considerably beyond a straight examination of

AIR FRAME MANUFACTURER

TENTATIVE SCHEME OF REPORTS

MANUFACTURING BRANCH

Control Area	Manufacturing Branch Executives: Manufacturing Manager	Chief Tool Engineer	Works Manager	Master Schedule Manager	Director of Prod. Control	General Purchasing Agent	Director of Inspection	Plant Engineer	Chief Industrial Engineer	Transportation Manager
QUALITY	Summary of all quality performance	Quality performance on tool design and manufacture	Quality performance on manufacturing workmanship	-	Quality for materials handling and storage	Quality of purchasing performance	Summary of all quality performance	Quality performance on chemical processes and maintenance	-	Quality responsibility for materials handling
	-	-	-	-	-	Quality record of vendors	-	-	-	-
	-	-	-	-	-	-	Inspection control statistics	-	-	-
									Quality performance on standards	
COST By Organization Units	Direct labor summary	Own direct labor	Own direct labor	-	-	-	-	Own direct labor	-	-
	Indirect labor summary	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor	Own indirect labor
	Summary of other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items	Own other overhead items
	Summary of non-standard material usage	Own non-standard material usage	Own non-standard material usage	-	Summary of non-standard material usage	-	-	Own non-standard material usage	-	-
	Purch. price performance	-	-	-	Purch. price performance	Purch. price performance	-	-	-	-
By Projects	Direct labor summary	Own direct labor	Own direct labor	-	-	-	-	-	Direct labor summary	-
	Material position summary	Material position summary	Material position summary	-	Material position summary	Material position summary	-	-	-	-
	Project manpower requirements and utilization	Own project manpower requirements and utilization	Own project manpower requirements and utilization	Project manpower requirements and utilization	-	-	-	Project manpower requirements	Project manpower requirements and utilization	-

Exhibit 1
Page 1

Exhibit 1
Page 2

SCHEDULE

Master schedules and project plans	Master schedules and project plans	Master schedules and project plans	Master schedules and project plans	Master schedules and project plans	Master schedules and project plans	Master schedules and project plans	Master schedules and project plans
Schedule performance summary	Schedule performance summary	Schedule performance summary	Schedule performance summary	Schedule performance summary	Schedule performance summary	Schedule performance summary	Schedule performance summary
Engineering schedule position	Engineering schedule position	-	Engineering schedule position	Engineering schedule position	-	-	-
-	-	Prod. cont. shop orders schedule position	Prod. cont. shop orders schedule position	Prod. cont. shop orders schedule position	-	-	Prod. cont. shop orders schedule position
-	Tooling schedule position	Tooling schedule position	Tooling schedule position	-	-	Tooling schedule position	-
-	-	Fabrication schedule position	Fabrication schedule position	-	Fabrication schedule position	-	Fabrication schedule position
-	-	Assembly schedule position	Assembly schedule position	-	Assembly schedule position	-	Assembly schedule position
-	-	Outside production schedule position	Outside production schedule position	Outside production schedule position	Outside production schedule position	-	Outside production schedule position
-	-	-	Procurement schedule position	Procurement schedule position	Procurement schedule position	-	Procurement schedule position
Spares schedule position	-	Spares schedule position	Spares schedule position	Spares schedule position	Spares schedule position	-	Spares schedule position

AIR FRAME MANUFACTURER

TENTATIVE SCHEME OF REPORTS

MANUFACTURING BRANCH

Manufacturing Branch Executives

Control Area	Manufacturing Manager	Chief Tool Engineer	Works Manager	Master Schedule Manager	Director of Prod. Control	General Purchasing Agent	Director of Inspection	Plant Engineer	Chief Industrial Engineer	Transportation Manager
PERSONNEL	Summary of manpower on hand and future requirements	Own manpower on hand and future requirements	Own manpower on hand and future requirements	-	Own manpower on hand and future requirements	Own manpower on hand and future requirements	Own manpower on hand and future requirements	Own manpower on hand and future requirements	Own manrower on hand and future requirements	Summary of manpower on hand and future requirements
	Summary of general personnel statistics	Own general personnel statistics	Own general personnel statistics	-	Own general personnel statistics	Own general personnel statistics	Own general personnel statistics	Own general personnel statistics	Own general personnel statistics	Own general personnel statistics
	Summary of grievance position	Own grievance position	Own grievance position	-	Own grievance position	Own grievance position	Own grievance position	Own grievance position	-	Own grievance position
	Summary safety data	Own safety data	Own safety data	-	Own safety data	Own safety data	Own safety data	Own safety data	-	Own safety data
	Training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position	Own training requirements and position
FACILITIES	Investment	-	-	Investment	-	-	-	Investment	-	-
	Summary of quantity, use and condition	Own quantity, use and condition	Own quantity, use and condition	-	Own quantity, use and condition	-	-	Summary of quantity, use and condition	-	Own quantity, use and condition
	Project tool status	Project tool status	-	Project tool status	-	-	-	Project tool status	-	-
	Construction projects, plans and progress	Construction projects, plans and progress	Construction projects, plans and progress	Construction projects, plans and progress	Construction projects, plans and progress	Construction projects, plans and progress	-	Construction projects, plans and progress	-	Construction projects, plans and progress
	Actual vs. capacity for critical depts.	Actual vs. capacity for critical depts.	Actual vs. capacity for critical depts.	Actual vs. capacity for critical depts.	Actual vs. capacity for critical depts.	Actual vs. capacity for critical depts.	-	-	-	-
	-	Own housekeeping	Own housekeeping	-	Own housekeeping	-	Own housekeeping	Summary of housekeeping	-	Own housekeeping
	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget	Capital Asset Budget

Exhibit 1
Page 3

Exhibit 1
Page 4

OTHERS										
Inventories	Analysis and turnover Forecast	Analysis and turnover of perishable tools and non-prod. inven. -	- -	Analysis and turnover Forecast	Analysis and turnover Forecast	- Forecast	- -	- -	- -	- Forecast
Work Load	Summary of conditions and forecast	Tooling work load and forecast	Tooling work load and forecast	Tooling work load and forecast	Tooling work load and forecast	-	-	-	Tooling work load and forecast	-
	-	-	Mfg. shop and work load forecast	Mfg. shop and work load forecast	Mfg. shop and work load forecast	Mfg. shop and work load forecast	-	-	Mfg. shop and work load forecast	Mfg. shop and work load forecast
	-	-	-	Prod. cont. work load and forecast	Prod. cont. work load and forecast	-	-	-	Prod. cont. work load and forecast	-
	-	Internal work load performance	-	-	Internal work load performance	Internal work load performance	-	Internal work load performance	Internal work load performance	Internal work load performance
Research	Progress and status on research in Engineering Mfg.Meth.&Prod Tooling Laboratory Standards Development	Progress and status on research in Mfg.Meth.&Prod. Tooling Laboratory	Progress and status on research in Mfg.Meth.&Prod. Tooling Laboratory Standards Development	Progress and status on research in Engineering	-	-	-	Progress and status on research in Laboratory	Progress and status on research in Mfg.Meth.&Prod. Tooling Standards Development	-
Profits & Finance	Financial report	-	-	Financial report	-	-	-	-	-	-
	Sales plan data	Sales plan data	Sales plan data	Sales plan data	Sales plan data	Sales plan data	-	Sales plan data	-	-
	Financial forecast	-	-	Financial forecast	-	-	-	-	-	-

each report. It permitted all reports to be positioned against the structure and all reports pertaining to a given control area to be viewed as a group, and it added the dimension of an orderly assessment of specifically what information was pertinent to achieving control in each area. The analysis disclosed areas not covered by reports, areas where report redundancy existed, and permitted the distribution of reports to be adjusted—in addition to opportunities for improving report design and content.

The point is that, at least in my experience, this was one of the early efforts to define total company-wide reporting requirements in terms of a structure built as a prerequisite to an evaluation of individual reports. Frequently, in those days, the problem of reporting was viewed as one of redundancy, and the objective was not a better reporting system, but rather one of reducing the number of reports and the cost of report preparation.

Some unique reporting concepts were developed on this assignment even though the available data were crude by today's standards. I might show a few examples:

Exhibit 2 is the top report on project schedule performance. It is designed to minimize the display of data and to focus on what are, in fact, trouble situations. It was prepared by the project co-ordinators and represented their assessment of conditions existent in each key phase of their project. Previously, this information had been communicated in a written memorandum pointing to all manner of late tooling, parts shortages, subcontractor delays, and the like, that left the reader to decide whether aircraft deliveries were likely to be on schedule or not. This new type of report required the project co-ordinator to commit himself, which is what he was being paid to do.

Exhibit 3 is a type of report offered in support of the previous exhibit and represents a technique for reporting status and degrees of status in assembly operations where there are definable stages to assembly. Today, such a report would display a quantification of off-schedule situations, such as the number of man-hours required to bring back to schedule, but those data were not then available.

Exhibit 4 was used to report status and performance in fabrication by showing the number of shop orders at each stage—unreleased, as released, in shop, and as they close to stock. It reports both load and behind-schedule status. Again, this would be considerably improved if

AIR FRAME MANUFACTURER

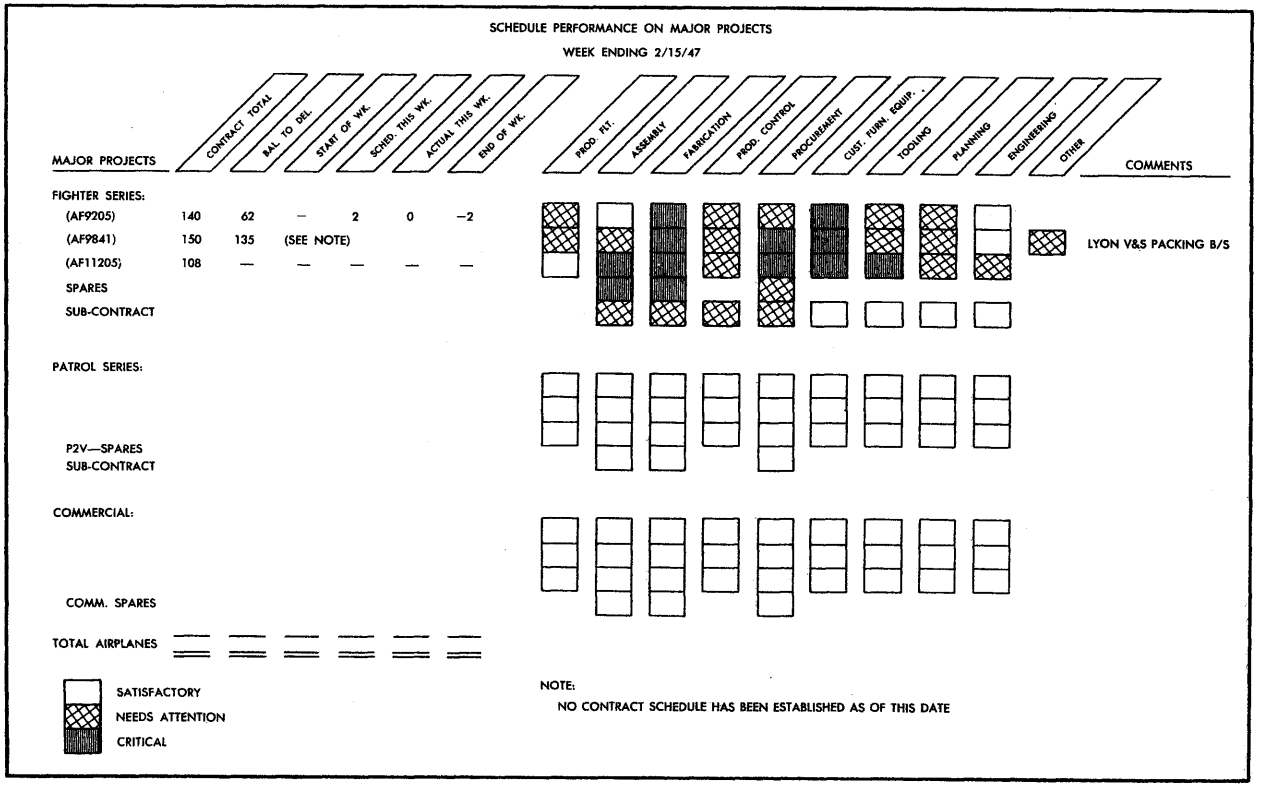


Exhibit 2

Exhibit 3

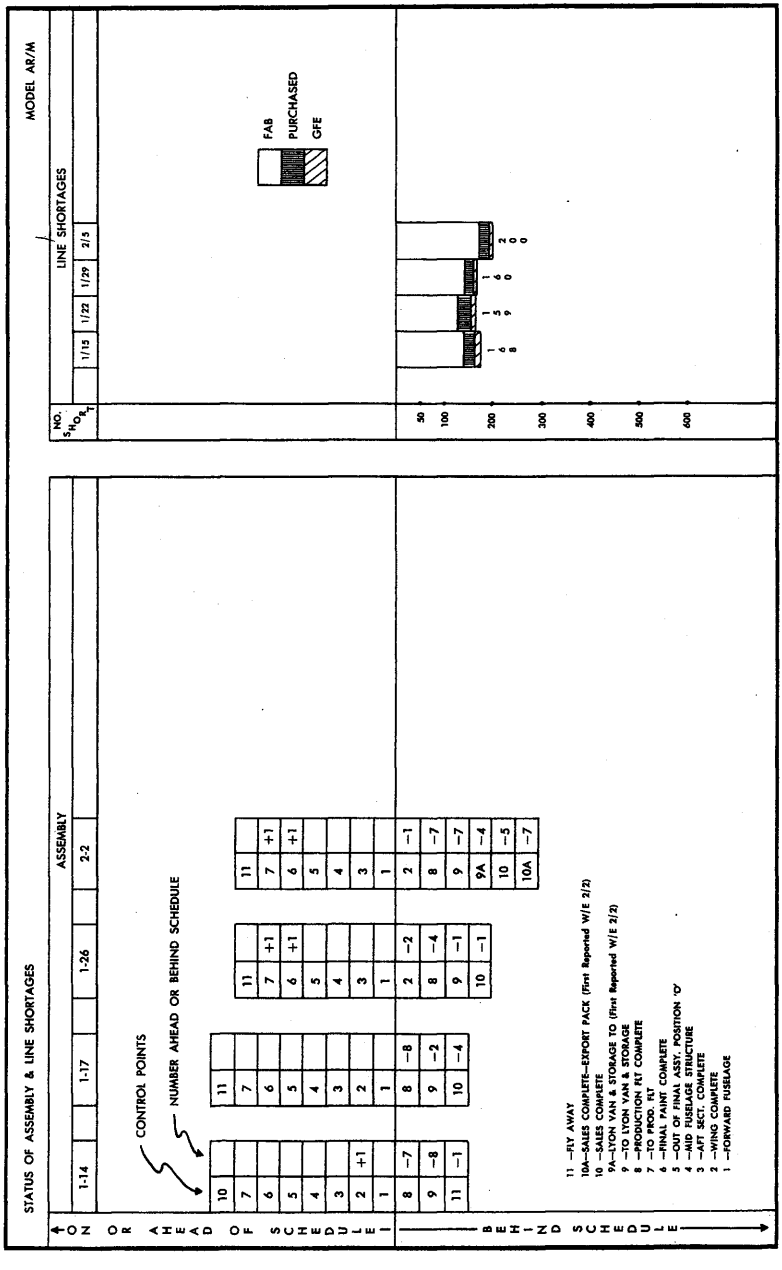
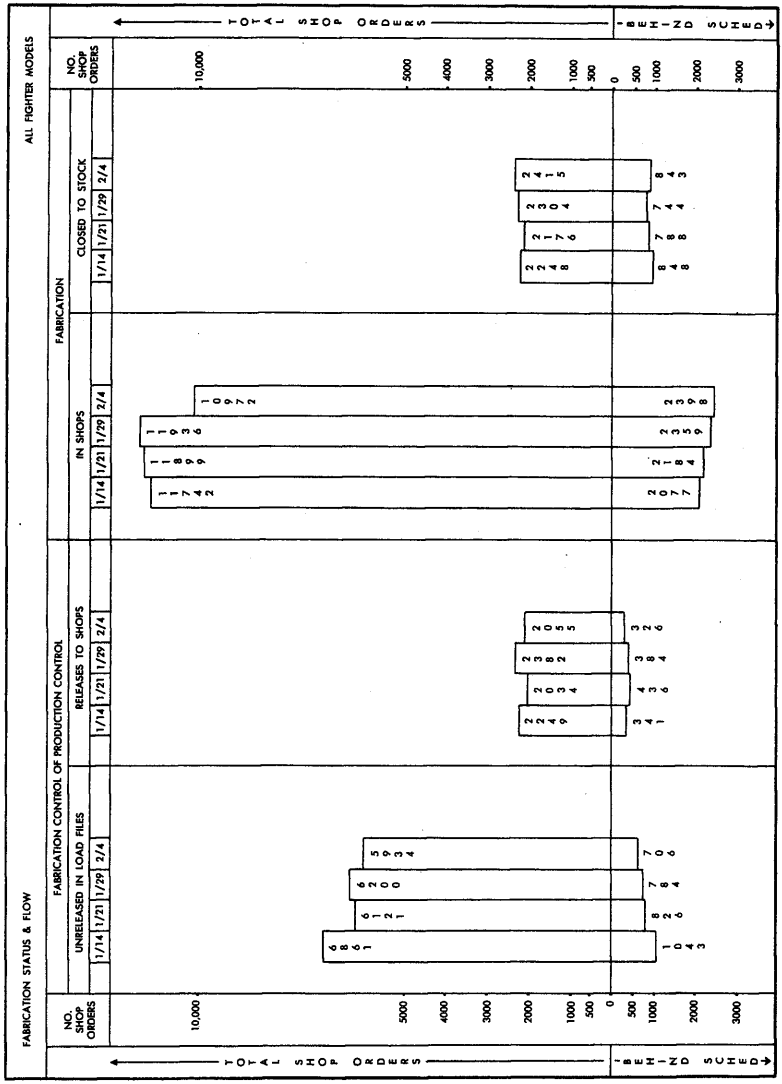

AIR FRAME MANUFACTURER
STATUS OF ASSEMBLY & LINE SHORTAGES
MODEL AR/M
ASSEMBLY
1-14
1-17
1-26
2-2
LINE SHORTAGES
1/15
1/22
1/29
2/5
NO. SHORTS
FAB
PURCHASED
GFE
CONTROL POINTS
NUMBER AHEAD OR BEHIND SCHEDULE
ORDER AHEAD OF SCHEDULE
ORDER BEHIND SCHEDULE
11 —FLY AWAY
10A—SALES COMPLETE—EXPORT PACK (First Reported W/E 2/2)
10 —SALES COMPLETE
9A—LYON VAN & STORAGE TO (First Reported W/E 2/2)
9 —TO LYON VAN & STORAGE
8 —PRODUCTION FLT COMPLETE
7 —FINAL ASSY. COMPLETE
6 —FINAL PAINT COMPLETE
5 —OUT OF FINAL ASSY. POSITION 'O'
4 —MID FUSELAGE STRUCTURE
3 —AFT SECT. COMPLETE
2 —WING COMPLETE
1 —FORWARD FUSELAGE

Exhibit 4


AIR FRAME MANUFACTURER
FABRICATION STATUS & FLOW
ALL FIGHTER MODELS
FABRICATION CONTROL OF PRODUCTION CONTROL
FABRICATION
UNRELEASED IN LOAD FILES
RELEASES TO SHOPS
IN SHOPS
CLOSED TO STOCK
NO. SHOP ORDERS
1/14
1/21
1/29
2/4
TOTAL SHOP ORDERS
BEHIND SCHED
10,000
5000
4000
3000
2000
1000
500
0
500
1000
2000
3000

AIRFRAME MANUFACTURER

SALES AND HOURS BACKLOG
FEBRUARY 26, 1950

Period of Anticipated Sales or Hours Expenditure	*Value of Undelivered Sales*				
	Airplanes			*Spares*	
	Air Force	*Navy*	*Commercial*	*and Other*	*Total*
1950					
March					
April-June					
July-Sept.					
Oct.-Dec.					
Total					
1951					
Jan.-March					
April-June					
July-Sept.					
Oct.-Dec.					
Total					
1952					
Jan.-March					
April-June					
July-Sept.					
Oct.-Dec.					
Total					
Beyond 1952					
Grand Total					
Net Change for Period					

Percentage Distribution of Sales and Hours

1950(1)
1951
1952
Beyond 1952

(1) Entire Year 1950

Minimum sales of $140,000,000 per year are required to produce $7,000,000 of annual net income. Minimum direct labor hours of 16,800,000 per year are required to produce $140,000,000 of annual net sales.

Exhibit 5

Over Under Minimum Sales	*Authorized Unexpended Direct Labor Hours*				*Over Under Minimum Hours*
	Engineering	*Tooling*	*Production*	*Total*	

the data were man-hours rather than shop orders, as each order is of different magnitude, but such data were not available from the limited data processing capability then in use. This same pattern of reporting was applied for all projects throughout all stages—assembly, fabrication, procurement, tooling, and engineering.

Exhibit 5 represents a 1950 attempt to get a perspective on backlog related to fiscal-period profits. As you know, this type of business is sold by projects and contracts having their own time frames. Accounting fiscal periods have another time frame. The question is—given a certain backlog—What can be expected in the way of fiscal-year income? This report is an attempt to relate sales dollars and labor hours of backlog to a bench-mark net earnings figure. This 1950 problem persists in 1967, and I am certain that with such supporting tools as PERT and PERT cost and the computer a more valid result is possible today than in 1950.

These last four exhibits are but fragmentary evidence of the type of reporting developed for this company in 1950. The fact was that a crude reporting structure was built as a frame of reference for evaluating individual control reports; and a set of reports was developed covering all areas specified by the structure and was integrated into a system of sorts.

There were limitations in that requirements were not developed in any considerable depth: Planning information as a basis for comparing actual results to plan was sparse; available data were not very accurate, complete, or timely; the effort dealt with reports, per se, and did not extend to the underlying systems applied in the functions being reported on. Regarding this last point it must be said that schedule status and performance was reported, but reports reflected deficiencies in the underlying scheduling procedures, and when results reflected poor performance it may have been as much a result of poor scheduling as poor performance. The same limitation was reflected in shop load reporting as well as in many other areas. In essence the approach was not one of saying, for example: "Let's develop the very best scheduling technique we can and build reports to show us how well we are operating that system"; but rather: "Given scheduling the way we do it, where do we stand in comparison with our contractual commitments?"

Such limitations notwithstanding, here was an effort to build a corporate-wide reporting system based on a predefinition of corporate-wide requirements.

A Mid-1950 Model

To illustrate the evolution of this type of approach I have selected a few examples from some work for a multi-store retailing company in the mid-1950s.

Exhibit 6 is a condensed version of the definition of reporting requirements for this company. You can see that requirements are expressed more explicitly here than in the 1950 model (and were spelled out further in details underlying this exhibit). There is considerable reference to "plan" of one form or another. The distribution of reports specifies not only who gets information on what, but why he gets it: because he has control responsibility, or to provide information that relates to his primary function, or because such information is necessary in planning his function. A key point here is that the reporting scheme identifies a single position as having "control" responsibility for each control area or factor. If "control" cannot be clearly assigned to a single position, organizational responsibility needs clarification or the control factor covers more than one element and should therefore be split into its components.

Exhibit 7 merely illustrates one technique applied in relating company performance to economic indicators—in this instance the Federal Reserve Index of Retail Sales for its Federal Reserve District. It evidences recognition that external information has a place in internal reporting.

Exhibit 8 brings together a number of measures related to sales that typically are reported separately. Considerable integration of related data was built into this reporting system. But note also the fact that all actuals are related to plan—and that last year or last period doesn't show at all. Considerable emphasis was applied in this situation to developing a comprehensive planning system to accompany improvements in reporting. The elimination of prior-year comparison is a radical departure from the retail merchant's basic orientation. Typically, a merchant can hardly wait each morning for the prior day's sales run so he can compare it with yesterday, Tuesday last week, the same Tuesday last year, and at the same time compare temperature and weather data for all those days. The theory applied in eliminating prior-year comparison was, of course, that the prior year is one of the factors considered in setting up this year's plan, and once the plan is established, management expects planned performance, not last year's performance.

Exhibit 6

A RETAIL DEPARTMENT STORE

OVERALL CONTROL REPORTS SCHEME

MAJOR CONTROL AREAS	SUB-CONTROL AREAS & REPORT COVERAGE	PRES	GEN MDSE MGR	GEN SUPT
OVERALL OPERATING RESULTS	CONSOLIDATED & BY MAJOR UNITS- SALES THRU NET INCOME	C		
FINANCIAL POSITION	CONSOLIDATED & BY MAJOR UNITS:			
	BALANCE SHEET	I		
	CASH POSITION			
	ACCOUNTS RECEIVABLE STATUS			
	COLLECTION PERFORMANCE			
	INVENTORY POSITION & TREND		C	
	FIXED ASSET BUDGET & STATUS:			
	OVERALL COMPANY	C		
	OWN PROJECTS		C	C
INDUSTRY & COMPETITIVE POSITION	SALES PERFORMANCE VS COMPETITION	I	I	
	SALES, MERCHANDISING, STOCK, EXPENSE, & PROFIT PERFORMANCE VS OTHERS IN THE INDUSTRY			
	COMPARATIVE MERCHANDISING	I	C	
SALES	SALES PERFORMANCE - BY STORE (DOLLARS & STATISTICAL, ie, TRANSACTIONS, AVERAGE SALE, ETC.)	I	C	I/P
	SALES CHARACTERISTICS - (CHARGE, CASH, CONTRACT, ETC.)			
DEPARTMENTAL MERCHANDISING DEPARTMENTS	PERFORMANCE AGAINST PLAN:			
	SALES	I/S	C	I/PS
	PRICING - MARKUP - MARKDOWN	"	C	"
	ANTICIPATION & CASH DISCOUNTS	"	C	"
	STOCK SHORTAGES	"	C	"
	WORKROOM CHARGES	"	C	"
	GROSS MARGIN & GROSS PROFIT	"	C	"
	SELLING EXPENSES	"	C	"
	OTHER EXPENSES	"	C	"
	INCOME FROM CONTRACTS	"	C	"
	NET PROFIT	"	C	"
	STOCK STATUS & PERFORMANCE	"	C	"

PERFORMANCE	WORKROOMS	PERFORMANCE AGAINST PLAN: WORK LOAD COST & EXPENSE SCHEDULE PERFORMANCE & BACKLOG	 I/S " "	 I/P " "	 C C C
	WORK CENTERS	EXPENSE PERFORMANCE AGAINST BUDGET & EXPENSE RATIOS: OVERALL OWN DEPARTMENT(S)	 C C	 C	 C
BUYING		MARKET CONDITIONS - PRICE TRENDS, AVAILABILITY, ETC. VENDOR PERFORMANCE	I/S	I C	
QUALITY OF SERVICE		PERFORMANCE & TREND IN KEY FACTORS REPRESENTING SERVICE: OVERALL COMPANY OWN DEPARTMENTS	 C	 I C	 C
PUBLICITY		EXPENSE PERFORMANCE ACTIVITY & RESULTS COMPETITIVE ACTIVITY	I I I	I I I	
PERSONNEL		MANPOWER - EMPLOYMENT & TURNOVER OTHER PERSONNEL ACTIVITIES	I I		 I
RESEARCH		PROJECT PROGRESS & STATUS: OVERALL COMPANY IF AFFECTED	 I	 I	 I
PROPERTY & FACILITIES		PROJECT PROGRESS & STATUS UTILIZATION (REQUIRED-AVAILABLE-USED-EXCESS)	C C	 I	 I
INSURANCE		EXPOSURES (CLASS OF RISK, AMOUNT, LOCATION) COVERAGES COST CLAIMS - FREQUENCY & STATUS	I/S " " "		

C - CONTROL
I - INFORMATION
I/S - INFORMATION IN SUMMARY FORM
I/P - INFORMATION FOR PLANNING

Exhibit 7

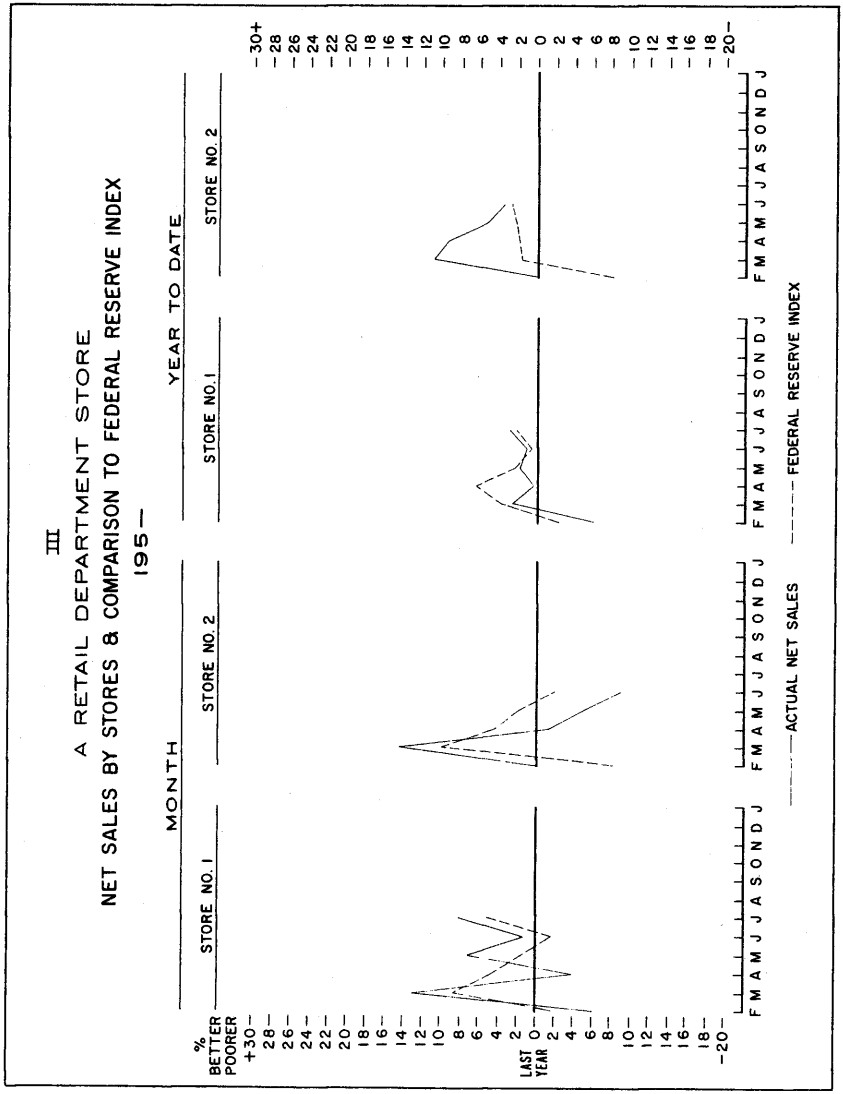

III
A RETAIL DEPARTMENT STORE
NET SALES BY STORES & COMPARISON TO FEDERAL RESERVE INDEX
195—
MONTH
YEAR TO DATE
STORE NO. 1
STORE NO. 2
STORE NO. 1
STORE NO. 2
% BETTER POORER
LAST YEAR
+30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0 2 4 6 8 10 12 14 16 18 20
F M A M J J A S O N D J
ACTUAL NET SALES
FEDERAL RESERVE INDEX

Exhibit 8

IV

A RETAIL DEPARTMENT STORE

SALES STATISTICS

MONTH ENDED ——— - 195—

	GROSS SALES			NUMBER OF TRANSACTIONS							
		BETTER (POORER) THAN PLAN			BETTER (POORER) THAN PLAN		AVERAGE SALES		SALES RETURNS (NO. OF GROSS SALES)		NUMBER OF SENDS	
	ACTUAL	AMOUNT	%	ACTUAL	AMOUNT	%	ACTUAL	PLAN	ACTUAL	PLAN	AMOUNT	PLAN
STORE NO. 1												
STORE NO. 2												
STORE NO. 3												
STORE NO. 4												
TOTAL												
YEAR TO DATE												
STORE NO. 1												
STORE NO. 2												
STORE NO. 3												
STORE NO 4												
TOTAL												

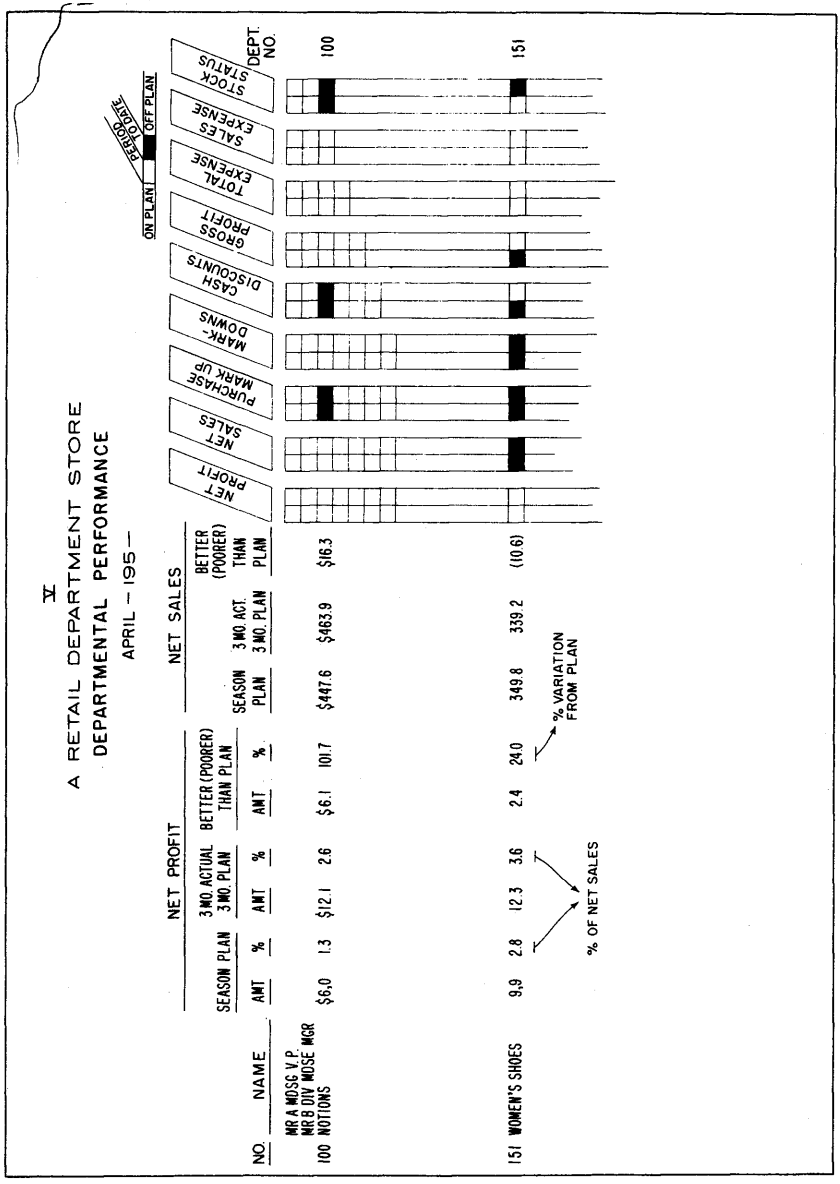
Exhibit 9 illustrates some quite unique reporting techniques. In this case there were several hundred sales departments, and the problem was one of permitting an orderly assessment of so much data by the men at the top. Every key element was identified and each was planned. Numbers were used only for the key profit and sales figures, and a box-type coding was used for the other elements. This box-type coding can be read horizontally to determine the situation in any department and also vertically to discern generalized problems of mark-downs or other factors running through merchandise groups or the whole store. Comparison is to plan—a 6-month plan, since there are two planning cycles in a retailer's year. Also, you might note that profit and sales are reported on the basis of the results expected for the total season plan by adding actuals for periods past to the plan for periods ahead.

These exhibits on the department store are shown to point out that by the mid-1950s the problem was still viewed as essentially a management reporting problem, but the definition of requirements—the reporting structure—had been broadened and further developed; considerable emphasis was placed on the planning segment of the control system. In this instance, at least, attention was not given to system techniques for performing the underlying functions, but they were already quite well developed in this situation. The availability of data was quite good, which is characteristic of many of the better retail organizations that live by statistics, although computer systems installed later provided improvements in the data.

Profit-Planning Systems

The first situation I described indicated the response to a problem defined as a reporting matter, and the solution was developed largely by re-structuring and re-packaging information that was already flowing within the company. The second situation included what was done in the first case, but also extended to development of more comprehensive planning of the various elements being reported on. As this evolutionary process continued, subsequent work was directed at developing comprehensive planning systems to accompany development of reporting systems and ultimately the integration of these efforts into what have come to be termed "profit planning systems" or "profit planning and control systems."

Exhibit 9


V
A RETAIL DEPARTMENT STORE
DEPARTMENTAL PERFORMANCE
APRIL - 195-
NET PROFIT
NET SALES
NO.
NAME
SEASON PLAN
3 MO. ACTUAL
3 MO. PLAN
BETTER (POORER) THAN PLAN
SEASON PLAN
3 MO. ACT.
3 MO. PLAN
BETTER (POORER) THAN PLAN
AMT
%
AMT
%
AMT
%
AMT
%
100 NOTIONS
MR A MOSG V.P.
MR B DIV MOSE MGR
$6.0
1.3
$12.1
2.6
$6.1
101.7
$447.6
$463.9
$16.3
151 WOMEN'S SHOES
9.9
2.8
12.3
3.6
2.4
24.0
349.8
339.2
(10.6)
% OF NET SALES
% VARIATION FROM PLAN
NET PROFIT
NET SALES
PURCHASE MARK UP
MARK-DOWNS
CASH DISCOUNTS
GROSS PROFIT
TOTAL EXPENSE
SALES EXPENSE
STOCK STATUS
ON PLAN
OFF PLAN
PREVIOUS YEAR
DEPT. NO.
100
151

In one such situation—a highly decentralized and diversified company—the approach was to assign to each operating segment a sales, net earnings, and return-on-investment target, and a profit-planning and control system was established to assist local management in meeting the goals. Sometimes return on investment is applied merely as one of the tests in evaluating and approving profit plans developed without regard to predetermined targets. In any event, as I view it, the profit-planning and control system represents the next level in management-information system developments.

This type of system includes a reporting segment and a planning segment, but the focus is on developing a planned net profit, return on investment, and earnings per share. Therefore the elements in and behind the income statement are given the priority emphasis.

The philosophy or rationale behind profit planning goes like this:

Return on investment is a function of capital employed and of profits. Profits are a function of sales and costs, which in turn go back to marketing techniques and production methods and to still other factors. The investment side of the equation similarly depends on facilities, inventory levels, credit policies, and other factors. These various factors, which finally converge in the return-on-investment formula and affect what the return on investment is to be, are the result of many decisions made by many people in an organization. The people making these decisions are generally responsible for particular functions and express their objectives in terms of their particular function. The necessity of breaking down the various functions of running a business and assigning them to positions in an organization structure inevitably results in a whole series of apparently conflicting objectives.

Inventories are an obvious example. Sales likes a large inventory so that no customer will be denied immediate service. Finance is interested in having minimum working capital tied up in inventories. Production prefers level rates of activity and to let inventory take the ups and downs in sales. Generally, one can say that, other things being equal, each function prefers to play the game to facilitate its own objectives. The fact of life is that other things are generally not equal, and it is up to general management to achieve balance. This matter of balance extends even beyond a balance between functions; it extends to a balance among various objectives within a function. For example, management wants a balanced performance in meeting the several production objectives of

cost, schedule, and quality. Not quality at any cost. Not performance on schedule regardless of quality. But a balance among all three objectives.

Here, then, is the problem: We have a requirement for some level of return on investment and earnings per share; and an organization structure in some manner assigning responsibility for functions to an array of individuals, each individual being faced with making the many decisions regarding the particular subject matter charged to him. How do we get everyone concerned focused on a single set of objectives and make certain that individual decisions will produce an aggregate result that hits the target? A profit-planning and control system provides some of the answers to this problem.

It seems to me that there is quite a bit of confusion about what profit planning really is. We all observe such terms as forecasting, budgeting, standard costs, responsibility accounting, responsibility reporting, long-range planning, and the like. When profit planning, as a term, came into vogue, I found instances where profit planning was defined as budgeting, and where budgeting was defined as profit planning, and I found all sorts of combinations in terminology. What finally helped resolve this matter in my mind was the realization that profit planning encompassed all these things—budgets, forecasts, responsibility accounting, standards, and so on, and when coupled with reporting, the result represented a planning and control system.

In this perspective, profit planning comes into focus as a structure or modus operandi for bringing together the sales forecast; a production plan designed to meet this demand, converted to production costs; and planned or budgeted engineering, distribution, and administrative expenses necessary to support this sales and production activity. The result is planned profit, earnings per share, and return on investment. The scope of the structure may be extended to encompass cash requirements, inventory levels, capital-asset controls, and other factors dependent on planned profits as well as on the elements of sales and production underlying a profit result.

In this context, profit planning is not a technique per se, but is rather, in a sense, a structure comprising budgets, forecasts, standards, and other elements, which are techniques applicable to particular elements contributing to profits and thus to a profit plan. Budgeting is not a term synonymous with or equivalent to profit planning, but is a technique for predetermining and controlling expenses; standard costing is

a technique for predetermining and controlling production costs; sales forecasting is a technique or series of alternative techniques for predetermining expected sales. These and other techniques may all have particular applications in a profit-planning structure. The purpose of the structure is to bring together and relate the best means for bringing about an achievable profit result, and techniques are selected according to their utility in achieving that objective.

Profit planning is, however, in an important respect, more than a structure; it is a corporate way of life; it is a philosophy for running a business. That this be recognized by the people at top levels in an operation is of paramount importance if a program of profit planning is to be successful. Profit planning is more than an accounting system, although accounting is included. It is more than a reporting system. Rather, it is a programmed approach to decision-making and for ordering the affairs of the business.

Before the concept and term "profit planning" came along, companies predicted sales, developed production costs, budgeted expenses, and the like. What are the essential ingredients added by profit planning? I believe there are four:

First, profit planning brings over-all objectives of the operation into the process and provides that they be formalized and quantified as never before.

Second, the several forecasting, planning, costing, and reporting activities are integrated into a co-ordinated program.

Third, attention to these activities is moved up into the top echelon of the business rather than allowed to remain as departmental or accounting matters.

Fourth, profit planning becomes a corporate way of life and the fundamental approach to managing the entire enterprise.

Generally, companies attempting to achieve profit planning and control proceed to deal with techniques—sales forecasts, budgets, standard costs, and the like—and fail to recognize the need to build the structure in which all these other elements are but parts.

Exhibit 10 of the material given you illustrates what I mean by structure. And some of this looks similar to what you have seen on previous exhibits, as it should—because it all grew out of ideas originated in the first example we considered. The information on this exhibit is condensed and generalized from actual cases in our experience. In

Exhibit 10

SCHEME ILLUSTRATING THE APPLICATION OF THE PLANNING AND CONTROL CONCEPT

CONTROL AREAS	PLANNING	ACCOUNTING	CONTENT	REPORTING DISTRIBUTION
Sales:	Planning may be in form of:	Records of actual results:	Adequate coverage of each control area to show:	Distribution tied to assignment of authority and responsibility under organization plan - only those in position receives report for control purposes - others may receive for information and planning purposes if report is related to their assigned functions.
Volume	Forecasts	Dollars	Results
Price	Budgets	Units and quantities	Performance
Mix	Standards:	Hours	Variations from plan
Profitability	Internal	Number of occurrences	Cause
Type customer	External (published industry indexes, etc.)	Etc.	Responsibility
Customer	Includes accounting or measuring in broad sense - accounting, statistical, operating data.	Integrated to bring together related factors - show cause and effect
Geographically	Leadtimes	Presented from low to higher echelons
Size order	Turnover rates
# of market	Etc.
Replacement vs. service parts
Backlog - work vs. capacity
Etc.
Production level vs. capacity
Cost:
Labor
Material:
Usage
Price
Overhead:
Expense:
Variable/fixed
Controllable/non-controllable
Rates
Product
Cost center/department
Schedules:
Performance
Shortages
Load
Procurement:
Competitive prices
Schedule performance/shortages
Economic purchase quantities
Supplier analysis and selection
Quality - receiving inspection
Profit:
Dollars
Return on investment
Per share
Breakeven points
Cash
Receivables
Inventories:
Class
Level
Turnover/days of supply
Obsolescence
Personnel:
Turnover/headcounts
Training
Promotability
Quality:
Rejects
Scrap
Returns
Research and development
Etc.

OTHER ILLUSTRATIONS OF MAJOR CONTROL AREAS

DEPARTMENT STORE

Overall operating results
Financial position:
Balance sheet
Cash position
Accounts receivable status
Collection performance
Inventory position and trend
Fixed asset budget status
Investments and competitive position:
Sales performance vs. competition
Comparative merchandising
Sales, stock, expense, and profit performance vs. other AMC units and Harvard data
Sales:
Store
Department:
Dollars
Transactions
Cash, charge, contract, etc.
Departmental performance:
Merchandising departments:
Sales
Pricing, mark-ups/mark-downs
Anticipation and cash discounts
Stock shortages
Selling expense
Etc.
Workrooms
Work load
Costs
Etc.
Workcenters
Expense
Etc.
Buying
Quality or service
Publicity
Personnel
Research
Physical and facilities
Insurance

PORT OPERATION

Revenues:
Operating revenues
Department
Major type:
Dockage, shedding, tollage, leases, etc.
Non-operating revenues:
Subsidies
Investments
Etc.
Activity statistics:
Facilities usage
Current activity and trend
Competitive position
Costs and expenses:
Revenue producing departments:
Docks:
Wharf's and sheds
Bascule conveyors
Harbor patrol
Administration
Etc.
Commodity warehouse:
Etc.
Etc.
Etc.
Non-revenue producing departments:
Engineering:
Design and construction:
Costs and expense
Application of charges to projects:
Direct
Through overhead
Etc.
Operating gain or loss
Construction program:
Long range:
Major projects:
Cost
Schedule
Source of funds
Short range
Etc.
Balance sheet items
Other

practice nowadays, actual structures are considerably more specific and detailed.

Essentially, this scheme or structure brings together the key elements in profit planning and control—control areas and control factors, planning, accounting (or measurement or scorekeeping), and reporting; they are the columns across the exhibit. Taking each column:

Control areas is the result of analyzing the characteristics of the business in its total scope to identify and classify all areas and factors that must be controlled to produce a satisfactory over-all result. Some of these are obvious, as in the sales and cost areas. Others are not so obvious, such as personnel factors, schedule factors, and the like.

Has such an inventory ever been made of your operation? Probably not; yet I would bet that you assume all these factors are being given attention. How do you know for sure? How do the people working for you know? Generally, something happens that you don't like. You check into it and find that somebody dropped the ball or no one knew he was supposed to look after this matter; you get that one fixed right now. Tomorrow you have another one, and so it goes, day after day. The approach here is to fix all this by identifying all the areas and factors that must be given attention and to proceed from there.

Planning comes next. The essence of planning, as the term is used here, is to predetermine what results should be. Here, you considered how best to establish a standard of performance or goal for each factor —a forecast, budget, standard, some external index, or what? The composite application of all these planning techniques must in due course produce a total result that satisfies the return-on-investment objective. It is in this step that we see slotted the various techniques that are confused by some as being profit planning in themselves.

Accounting follows—and this could better be described as measurement or scorekeeping. Once control factors and the basis for planning are determined it is relatively easy to decide what you need to keep track of to know where you stand. This covers all types of data—accounting, operating, and statistical—on all the types of subject matter.

The *Reporting* segment coincides with what was reviewed in the prior examples and represents a specification of what reports and report content are appropriate to display the results of operations and performance—over all and for each function and control factor.

Reporting extends also to the distribution of reports. Who should get what information, on what subject matter, and for what purpose?

The reporting system that goes with profit planning and control has to do with giving each key person the information he needs to do his job effectively—and no more. The answer to this question depends on what his job is: What is he responsible for controlling? This is a matter of organization, and the purposes for providing information to each position are coded, as shown in the example reviewed earlier in this presentation.

Up to this point no profit planning has been done—only the structure has been built. This process once done right does not need to be repeated, although it does need to be reviewed periodically for up-dating to reflect changes in the operation, new planning techniques to be applied, changes in organization, and similar matters. A lot has been accomplished, however, but implications extending beyond the base for profit planning are present.

- Key control factors have all been identified and classified, and responsibility for each one has been specified.
- The types of planning techniques have been selected so that efforts to develop the techniques in detail can be programmed to proceed in an orderly manner.
- Accounting, measurement, and record-keeping requirements have been specified. Procedures work and selection of data processing methods can be undertaken in terms of a set of specific requirements. The mistake of proceeding to select hardware to produce data before making a thorough definition of data requirements is avoided.
- The system of reporting has been blueprinted, not only for the moment but for the future, since means are available to continue control over reports by comparing demands for new reports to the basic structure.

As you can see, this type of analysis and layout of structure forms a blueprint for the whole planning and control system. It provides a fix on scope. It permits comparison of techniques and procedures already existent with what will be required and provides the base for developing action programs or task lists for accomplishment of the over-all system.

Under this approach the next step is to design pro forma reports. Then, given the structural layout or scheme and a set of reports, you are ready to deal with the procedural matters necessary to generate planning and actual data for the production of reports.

It is fundamental to this approach that you think broad and start at the beginning. The beginning is to think the problem through; identify

all control areas and relate them to organization; select appropriate planning and accounting techniques, and complete this phase with an over-all structure and report package. It is only when requirements have been so defined that techniques, methods, and procedures can be intelligently selected and actual planning begun.

Given the structure, report package, and underlying procedures, a profit-planning system includes an annual planning cycle, and sometimes planning is recycled quarterly. I am not going to discuss the intricacies of the planning process to any extent, except to point out that an overriding problem in planning is to estimate the economic climate in which you expect to operate during the period being planned. I believe it was Dr. Burns, Chief of President Eisenhower's Council of Economic Advisors, who termed this the problem of the boat and the passenger. To evaluate the ups and downs of the business passenger, you must take into consideration the ups and downs of the economic boat. Most businessmen try to move in a straight line or more on an upward slant. This leads to a tendency to use a straight-line measure of performance in a sine-wave environment. No individual businessman is going to do anything to eliminate the sine-wave situation. This is an order of problem for governments to work on, and even they only achieve a slight flattening of the curves—or perhaps heightening of them. Business cycles—prosperity, recessions, depressions—have been with the world since the beginning.

The practical implication of this to a company in its profit planning is that it should recognize this economic fact of life rather than pretend that cycles don't exist and learn to use them advantageously in the conduct of the business. Learn to live with economic cycles instead of struggling against them—be a bear in a bear market and a bull in a bull market—as it were. A company should evaluate its plans according to the cycle most closely affecting it—the industry forecast or outlook, and then be realistic concerning its position in that industry. The well-managed company is one that makes its fair share of dollars when the cycle is on the downside as well as on the upside.

Out of this assessment of the economic environment compared with the company's position comes a set of planning premises establishing the parameters in which planning is to take place. Premises are expressed as return-on-investment or earnings-per-share objectives; as new products and facilities expected to come on-stream; financial, capacity, and other

resource limitations; as level-of-employment objectives; and as other pertinent factors. If the heads of the various functions of a business are to establish functional plans that will integrate with a company plan, all planning must be based on common premises and common goals. Some of these matters are strategic and can only be properly decided at the general management level. If each department proceeds on its own assumptions regarding these matters, they are apt to have them changed and will have to re-plan when the general management review and approval takes place.

The need and practicality of establishing premises and goals is sometimes difficult to sell to the chief executive when this type of program is introduced for the first time. He may say, in considering the path that must be followed in arriving at the profit objective: "What do you mean by the strategic decisions that are involved?" It may, at any point in time, be strategic to forgo immediate profits in a product line in the interests of launching a new product or opening up new territories, or incurring research and development costs, or opening facilities with more capacity than currently required. He may say: "What do you mean by level of employment?" We mean: Do you want to plan for a single- or a multiple-shift operation? Is overtime to be relied on to cover peak periods: Are we to build inventory during slow shipping periods and level the work force or are we to plan on layoffs and rehires to match the shipping cycle? All these types of factors have sales, cost, and profit implications and should be decided at the outset. In some matters where management can't decide the issue offhand, plans may be developed on more than one premise so that the profit effect can be evaluated. In any event, thorough consideration of the matter of planning premises and goals in any given situation will disclose a considerable list of items requiring definition.

It is also at this stage that the matter of achieving balance among the conflicting objectives of several functions first comes up; this I mentioned earlier. By stating the premise underlying planning for inventories, for example, the sales production and financial people can all plan their activities accordingly.

Once premises are established, the remaining steps consist of each function's developing its plans; the consolidating of individual plans into a total plan for the over-all operation; and then reviewing, evaluating, and approving. It is not unusual for this planning activity to be recycled

more than once in order to come out with a result considered satisfactory.

In summary, a profit-planning and control system is achieved by:

Developing a profit-planning and control structure by—

> Identifying and classifying all the important control areas and factors in the company—not just financial areas, but marketing, operating, R & D, personnel, quality, and all the rest;
>
> Determining what type of planning techniques will be applied to each factor to predetermine what performance should result;
>
> Specifying what needs to be measured and accounted for to know what is going on;
>
> Designing a set of planning and control reports covering each and all factors and specifying who is expected to take action on the subject matter of each report;
>
> Developing and installing the underlying planning and accounting procedures.

A planning cycle is then undertaken to develop a comprehensive set of plans integrating into a total plan that meets the goals.

Given a comprehensive profit plan, the tasks are to measure and account for results; to report progress and status; and to take action to correct off-plan conditions.

At the beginning of this discussion I mentioned that it was fairly easy to establish a return-on-investment goal, but more difficult to see that all the diverse activities in the operation produced an aggregate result coinciding with or exceeding that goal.

So it is with profit planning and control. It is fairly easy for me to describe its elements and what the attendant difficulties are, but it requires considerable effort to develop an actual system and learn to use it.

The logic underlying profit planning is difficult to refute. Every person in a key position in a business is forecasting, budgeting, costing, and making profit-control decisions whether he realizes it or not. Every time he makes a major decision he inevitably or intuitively assesses the economic outlook, expected sales and production volume, the cost consequences, and the effect on profit. Yet a man in one functional area of a

business does not necessarily have the knowledge of plans and conditions in other areas. It makes but common sense to proceed on a basis that says: What are the key factors in this business? What are the better techniques for predetermining expected results in each factor? What information is required? Who is in the best position to use the information, apply the technique, and exercise judgment on the matter? And it makes but common sense to conclude by providing all those expected to make decisions with the results of this process once they are approved at the top. In this way everyone is tuned in on the same program, which has obvious advantages.

We might take a peek at the type of reporting a profit-planning and control system makes possible. Exhibit 11 shows a Report on Profit Plan taken from an actual system we helped to develop, but it displays hypothetical data. This, to me, is the type of top-control report the head of an operation should get from such a system. (Of course, the content would be decidedly different, depending on the type of business concerned.) Let me point to some of the features:

- It starts out by comparing over-all profit to planned profit.
- Next, it shows in some detail precisely where the differences in planned and actual profit arose. It shows *who* caused it (or should take action to correct it) and *what* caused it.
- Emphasis is on variances rather than on absolute amounts; variances are the things you want to do something about.
- Note the array of variances under "Responsibility of Sales"—volume, mix, price, and selling expense. (Let's ignore the cost variance here because this is an unusual situation peculiar to this company, and normally sales would not be charged with product-cost variances.)

Note that all comparisons are to plan—not with last year. Comparison with last year is really a pretty poor index of performance. Last year reflects your sins as well as your virtues, and while last year is one of the factors you should consider in planning next year, once you plan you should shoot at planned performance—not to outdo last year's performance.

The column headings on this report are unusual, as you will note in observing "Next Month Forecast" and "Entire Year Forecast." This system provided for holding the "Master Profit Plan" made at the beginning of the year as the basis for comparison throughout the year. However, each month a forecast was made of what they expected to do next

month and for the year, considering events so far. The concept here is to emphasize that the real target is total for the year and that variations are to be expected each period. The key question is whether gains and losses to date are to flow through into annual results or are to represent only differences in the time when events occurred (such as an order received this month that was planned for next month).

This is, of course, but the top report, and supporting reports further analyze these variations by product lines and products, major customers or channels of distribution, plant locations, and the like, or in whatever manner is appropriate for that type business. But the top man reviewing this type of report can draw a bead on the source of his problems in pretty short order.

The 1960s

A simple search for better reports disclosed a need for a reporting structure. As development of reporting structures unfolded, a planning dimension was added, and quite sophisticated planning and control systems have been built. I believe it is fair to generalize and say that this is about where we are in 1967 with regard to systems that are in fact operative. According to what I read, we supposedly are far beyond that point, but what I read doesn't coincide very well with what I see in actual practice in my journeys around the country.

There have been, and continue to be, considerable advances in the techniques applied within the planning and control framework—in forecasting, in scheduling, in costing, and in management decision-making generally. There is also no denying the increased application of the computer in all these processes, not only as an integral element in new developments, but as the means for applying in practice what was previously known but impractical to apply.

In practically every instance, however, we find the underlying data processing system built on an application-by-application approach, largely applied to routine—and heavily financial-related—data, but with some planning and control techniques appended to this flow.

Historically, each function of a business built its own systems in response to its particular needs. The production man, for instance, built his systems for moving materials through the plant into finished goods. The accountant built his accounting, planning, and control system as a

REPORT ON PROFIT PLAN

Exhibit 11

	THIS MONTH ACTUAL	YEAR TO DATE ACTUAL	NEXT MONTH FORECAST	ENTIRE YEAR FORECAST
NET INCOME BEFORE TAXES:				
Master profit plan	$ 8,200	$16,400	$ 8,200	$ 98,400
Actual and latest forecast	6,000	14,000	6,270	80,500
Gain (loss) from plan	$(2,200)	$(2,400)	$(1,930)	$(17,900)
ANALYSIS OF GAIN OR LOSS:				
Responsibility of sales:				
Volume gain (loss)	$ (400)	$ (600)	$ (300)	$ (3,600)
Mix gain (loss)	(800)	(1,300)	(1,550)	(18,000)
Price variance	1,000	800	400	4,800
Cost variance	(1,000)	(1,200)	(600)	(7,200)
Selling expense under (over) budget	200	400	200	2,400
Total	$(1,000)	$(1,900)	$(1,850)	$(21,600)
Responsibility of manufacturing:				
Materials price variance	$ 500	$ 200	$ 350	$ 3,600
Materials usage variance	100	150	125	2,500
Labor rate variance	50	(100)	(25)	(300)
Labor productivity variance	20	250	135	2,500
Factory expense under (over) budget:				
Variable costs	20	50	35	400
Fixed expenses	(490)	(150)	(300)	(1,000)
Total	$ 200	$ 400	$ 320	$ 7,700
Responsibility of administration:				
General expenses under (over) budget	$(1,500)	$(1,150)	$ (525)	$ (6,500)
Other	100	250	125	2,500
Total	$(1,400)	$ (900)	$ (400)	$ (4,000)
TOTAL AS ABOVE	$(2,200)	$(2,400)	$(1,930)	$(17,900)

separate mechanism. The accountant, in order to operate his systems, may have required certain outputs from production systems that become the inputs in accounting systems—but the pattern was essentially for each to build his own systems to meet his own limited objectives.

Some breaking down of the separate function- and application-oriented approach has of course occurred, and more of this is coming fast. In terms of what has been actually achieved, the situations I have seen reflect the merging of closely related segments into applications of larger scope. For example, some time ago we developed a system for a major airline that includes maintaining inventory records of expendables, monitors usage, produces reorders according to computer-programmed decision rules, produces purchasing documents, processes accounts payable, and maintains purchase commitment controls. But this system, even today, does not exploit the possibility of integration with maintenance cost controls, scheduling requirements, and the like, although this is sure to come.

THE 1970-MODEL SYSTEM

The opportunity to build the 1970-model system I am about to describe comes about through man's newly found ability to perform basic data processing operations more efficiently—matters of equipment and technique; and through his ability to define better his information needs —a matter of analysis and understanding. Progress has, of course, been made on both these aspects over the past 10 to 15 years. Historically, however, major attention has been first on equipment capability and processing techniques; only in recent years has the priority of emphasis shifted to an in-depth delineation of information needs. This is not to say that advances over the years in the degree of sophistication of business information have not been significant. They have been. But it seems to me that in this field we usually invent a better machine and then seek a use for it, rather than the other way around. Perhaps we have traditionally developed better engineers than we have people with the interest and ability to analyze the complexities of the business organism and then to identify all its relevant informational requirements.

The tendency in this field to confuse the "means" with the "ends" is widespread, and while this point may seem obvious to us discussing it here, you perhaps have to see, as I do, the quantity of IBM 360-level equipment going in around the country, and to see the way this is being

done, to fully appreciate the point—no re-definition of requirements or systems work (the ends), but simply the upgrading of equipment (the means); and even then these new systems are frequently operated through inefficient emulator routines.

The 1970-model systems avoid such mistakes, and they have several fundamental characteristics:

• The approach is highly requirements-oriented. (To the extent I can get away with it I won't even talk to a client about equipment until we exhaust the matter of requirements.)

• The approach to study, design, and implementation is functional and functional requirements are pursued in all their ramifications irrespective of the organizational compartmentation of divisions, departments, or other units.

• Scope is corporate-wide as to functions, locations, products, or any way you want to describe it—(I could say that it is "total," but "total" almost represents infinity—so let's say that it comprehends everything you can get your arms around).

• Scope also comprehends meeting requirements for management planning and control purposes, but importantly it extends to the various operating systems in a company—the way that work is carried on and decision-making is effected in day-to-day operations. In this sense it concerns all types of data—financial, economic, statistical, operational, and the like—and all types of activity.

• The objective is to build a single, fully co-ordinated system that interlocks planning, control, and operating requirements to the maximum feasible extent.

To a considerable degree this type and level of system represents an extension of the approach previously described as stemming from 1950. Its uniqueness in some respects is one of degree, but importantly it brings operating system requirements into the picture and substantially unifies departmental or functional segments of the problem into a single problem—the building of a corporate system. Let me show you what I mean:

Exhibit 12 illustrates the basic, over-all structure that we have developed up to this point in our work with this type and level of system. I am sure there is nothing final about this, and we expect it to be further developed and refined as we continue to gain experience.

• You will note that the over-all structure has three primary segments—

..Operating systems

..Planning and control

..Systems design and implementation, covering both EDP and non-EDP aspects

• The planning and control segment will appear familiar to you, as we have traced its development in our earlier discussions.

As shown, the objective is to specify, for all the functional areas of the business, the significant control areas and factors and how each is to be planned, measured, and recorded, and what is to be reported, to whom, and for what purposes.

• The operating systems segment is new—you have not seen this on previous exhibits. This is the "doing" aspect of a company's operations and relates to the systems applied in satisfying all the requirements that arise in day-to-day activity. Action on this segment requires an in-depth analysis of all activities.

Again the approach is functional, and the objective is to develop complete specifications of each cycle of activity, the inter-relationships of cycles, and the applicable decision rules.

• The third segment, at the bottom of the exhibit concerns the means to be applied in meeting requirements identified in the first two segments. As shown, there is a recognition that EDP is not going to be the only means applied, but there will continue to be non-EDP aspects as well.

Earlier, I made a point about the accountant's having his system, the production man his, and so on, wherein there existed a multiplicity of essentially discrete systems. Frequently this characteristic extends to there being several planning and control systems, oriented functionally or departmentally. Even where a single, rather highly integrated corporate-wide planning and control system has been built—such as those we looked at earlier—that system is superimposed on the underlying operating activities and is viewed as a separate mechanism. Obviously, the elements in a business organism are highly interrelated, and many interactions are continuously involved. Further, planning and control is applied to monitor, measure, and report on the events, decisions, and actions occurring in the business; planning and control has no purpose in and of itself, yet systems are built as though this were so. When these matters are approached all at one time and in a unified manner, a system can be built that reflects the best way of operating (which is where the

PUBLIC UTILITY

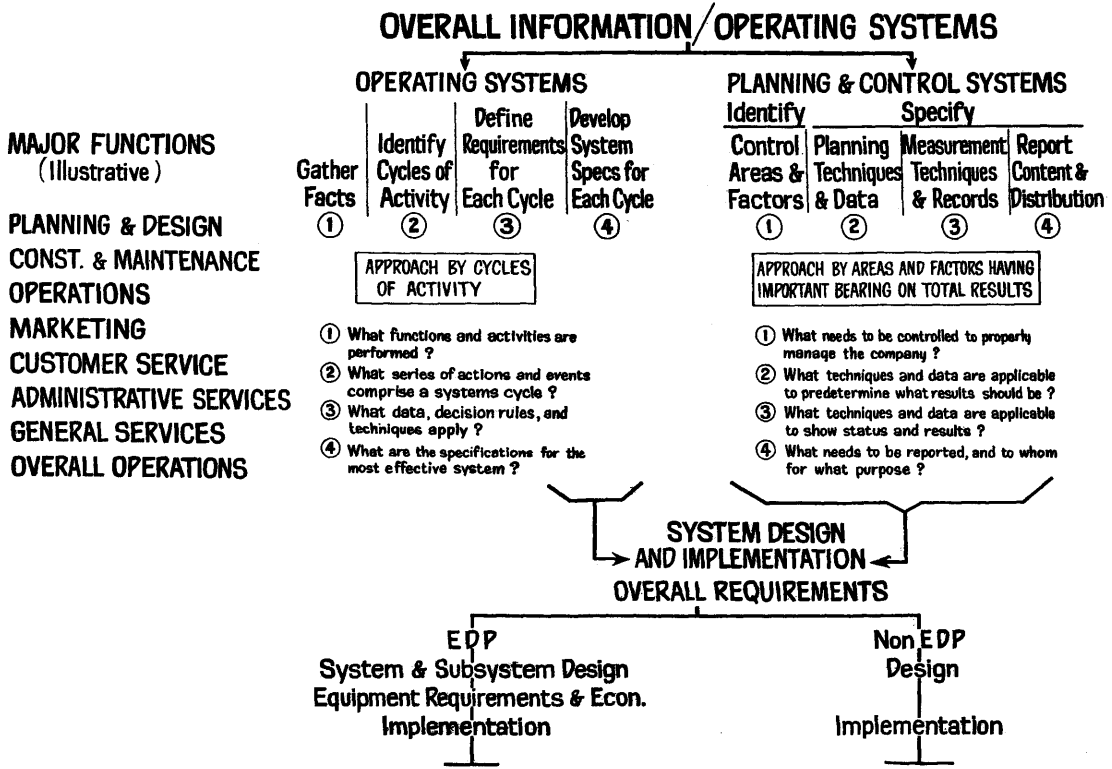


Exhibit 12

profit is generated) and planning and control features may be incorporated as an integral part of the whole system (to provide assurance that profit goals are met).

Exhibit 13 illustrates the resulting definition of planning and control requirements; it consists of a few pages taken from a set of requirements completed about a year ago.

• The complete set of requirements is a document of over 150 pages covering all control areas and factors in the company.

• Each of the elements entered is in process of further detailing as the specifics of each planning, measurement, and reporting item is reduced to system specifications for computer or other application and in preparation for the programming phase.

Operating system requirements are approached as cycles of activity. For example, in one situation we had a cycle covering all actions entering into the movement of product to customers—order entry, shipping to customers, billing, maintenance of accounts receivable; or entering into scheduling production and maintaining finished-product inventories —sales forecasting, production planning, finished good inventory maintenance, production scheduling, shipment to distribution centers.

There are, of course, any number of choices in selecting what activities to deal with as a cycle, but the objective is to carve out a manageable segment of operating functions that require a logical sequence to complete.

Exhibit 14 illustrates the first-level definition of operating system requirements from two situations. The first is but one page, among many, and shows production planning beginning back at the point of sales forecasting. The second is from a different company and follows a different format, but again it shows the top level of documentation of operating systems. The dotted circles represent points where elements of this operating system cycle relate or interlock with others.

We are looking at the very top level of operating-system definition, and this is taken through several lower tiers of detail and ultimately comes out in a specification of EDP outputs, inputs, file requirements, and processing steps or the equivalent for non-EDP applications.

What we have been looking at illustrates the first pass at defining requirements. As work proceeds down each leg of the basic diagram—the planning and control leg and operating-system leg—the results are brought together and are merged in the third segment. Here all operating

systems are interlocked, and planning and control requirements are built in. The result is a single set of system specifications serving all requirements that have been defined. As this is completed, computer, communication line, input-output devices, and other hardware and software decisions are made, economics are evaluated, orders are placed, and final design and programming takes over.

Some of the exhibit material comes from an engagement where a communication network is to be employed. Exhibit 15 shows the basic framework and Exhibit 16 shows the geography in this system.

Exhibit 17 at first glance looks like the combination lock on a bank vault, but if you will look more closely you will see that it demonstrates the degree of scope and integration being built into this system.

As shown, beginning with the outer ring, the system comprehends actions affecting customers and vendors, sales offices, plants, etc. It covers both planning and control and operating-system requirements. The major segments are order entry, procurement, accounting, production, and the like. At the various functions within these major segments and at the core stands a central computer file of information, interacting with all these functions as inputs, processing, and outputs are actuated.

Exhibit 18 is a page from a generalized summary of inputs and outputs for major segments and sub-segments designed to illustrate their interaction against a central computer file, or "data bank," as it is sometimes called.

This particular page is from the top-level documentation of the production segment of the system. It indicates the content of the central computer files and shows the type and sources of inputs and outputs employed in operating the sub-segments of the system; it also describes the actions taken within the system.

I should like to review Exhibit 19, which is the top master plan for this type of system and gives you some flavor of the actual conduct of such a project and what it includes.

The various major steps in the master plan are divided into five phases, as shown across the top of the schedule: preliminary actions, determination of over-all requirements and development of an interim revised reporting system, methods and equipment evaluation and selection, design and programming, and then installation and follow-up. Certain actions are taken to serve the planning and control segment, others to

GROCERY PRODUCTS AND FEED COMPANY

PLAN FOR MANAGEMENT INFORMATION-CONTROL SYSTEM
MARKETING AND DISTRIBUTION OPERATIONS
GROCERY PRODUCTS

AREA NUMBER	MAJOR CONTROL AREAS	PLANNING
2110	OVERALL PROFITABILITY AND ECONOMICS	
2111	Sales and Profit Contribution	
	Product/Brand/Groups Customers Market areas	Long-range plans as to sales and profit contribution expected from products, customers, and market areas
2112	Return on Assets Employed	
		Product area profit plans evaluated in terms of return on assets employed
2120	ADVERTISING AND MERCHANDISING OPERATIONS	
2121	Market Position and Trends	
	Industry trends Company position and trends Competitors' position and trends	Objectives in terms of industry trend forecasts and company share of market based on marketing plans
2122	Volume/Profit Contribution	
	Current volume/profit contributions by products and geographical areas	Sales forecasts carried to direct profit contribution by product, product group, and geographical area

Exhibit 13
Page 1

ACCOUNTING	REPORTING	REPORT FILE NO.	REPORT FREQUENCY
Sales, variable standard cost, and A & M expenditures by product Sales and direct profit contribution by customers and by geographical areas	Marketing profit contribution for this product area in terms of management responsibilities and product groups - actual compared to plan (Financial Statement - Schedules 7,8,9)	2111.1	Monthly
	Highlighted summaries showsources and trends of profit contribution by products, customers, and market areas (not yet being prepared)	2111.2	Annual
Assets by product area	Profit plan summaries showing return on assets employed (report not yet being prepared)	2112.1	Annual
Company, industry, and competitive product sales volume in pounds and/or dollars Company sales volume by trading area	Charts and summaries showing trend of company and competitors' product sales and share of market (generally Nielsen reports)	2121.1	Semi-annual
	Sales by trading area(Data Processing report)	2121.2	Monthly & Semi-annual
Sales, variable standard costs, and A&M expenditures, by products, product groups, and geographical areas	Actual sales quantities and variance from plan by products in total and by geographical areas (Business in the Bag report and monthly Data Processing report)	2122.1	Semi-monthly and Monthly

GROCERY PRODUCTS AND FEED COMPANY

PLAN FOR MANAGEMENT INFORMATION-CONTROL SYSTEM
MARKETING AND DISTRIBUTION OPERATIONS
GROCERY PRODUCTS

AREA NUMBER	MAJOR CONTROL AREAS	PLANNING
2122	Volume/Profit Contribution (Cont'd)	
	Payout of new product investment	New product payout objectives relating planned direct profit contribution to planned research, capital and A & M expenditures
	Position of products in life cycle	

Exhibit 13
Page 2

ACCOUNTING	REPORTING	REPORT FILE NO.	REPORT FREQUENCY
Cumulative new product sales and direct profit contribution, research expenditures, capital investment, and A & M expenditures	Net direct profit contribution after A & M by product group, variance from plan, and effect of volume, price, and mix on direct profit contributions (Data Processing reports)	2122.2	Monthly
	Latest sales and net direct profit contribution after A & M forecast to year end (prepared by Product Management)	2122.3	As Required
	Cumulative new product sales and direct profit contribution related to capital, research, and A & M expenditures for payout period - actual and variance from plan (report not yet being prepared)	2122.4	Quarterly
	Charts by product showing historical sales and significant events (report not yet developed)	2122.5	As Required

GROCERY PRODUCTS AND FEED COMPANY

PLAN FOR MANAGEMENT INFORMATION-CONTROL SYSTEM
MARKETING AND DISTRIBUTION OPERATIONS
GROCERY PRODUCTS

AREA NUMBER	MAJOR CONTROL AREAS	PLANNING
2123	Advertising	
	Progam and expenditures Products Media and preparation of broadcast and print materials Agencies Media discounts	Advertising programs based on overall marketing strategy and objectives Detailed budgets and schedules of advertising expenditures by products and product groups
	Effectiveness Creative effort Media	Determination of media discount opportunities based on marketing plans
	Competitive activity	

Exhibit 13
Page 3

Mktg. & Dist. Op.
Groc. Prods.
Page 3

ACCOUNTING	REPORTING	REPORT FILE NO.	REPORT FREQUENCY
Actual and committed advertising expenditures by product and nature of expense	Actual and committed advertising expenditures and variations from plan by product and nature of expense (Advertising Accounting report)	2123.1	Monthly
Media commissions and other payments to agencies by agency			
Media discounts earned	Actual advertising expenditures for each media and prep category by product and in total (prepared by Product Management during planning period)	2123.2	Annual
Tests of print and broadcast materials			
Surveys to determine advertising effectiveness - penetration, coverage and mix	Analyses of agency payments reflecting media commissions and other fees by product and in total (record maintained by Advertising Department)	2123.3	Annual
Estimated advertising expenditures and sales volume for competitive products			
	Media analyses showing discount opportunities and discounts earned (prepared by Advertising Agency)	2123.4	Quarterly
	Measurements of media and creative effectiveness; advertising effectiveness data - penetration, coverage, and mix (prepared by outside firms)	2123.5	As Required
	Summaries of sales volume and advertising expenditures - company vs. competition (estimated) (prepared by Advertising Agency)	2123.6	Annual

GROCERY PRODUCTS AND FEED COMPANY

PLAN FOR MANAGEMENT INFORMATION-CONTROL SYSTEM
MARKETING AND DISTRIBUTION OPERATIONS
GROCERY PRODUCTS

AREA NUMBER	MAJOR CONTROL AREAS	PLANNING
2124	Promotion	
	Programs and expenditures Trade and consumer Sales promotion	Promotional plans and schedules determined in conjunction with national and local marketing objectives and sales force workload
	Effectiveness	Budgets and schedules for trade and consumer promotions by product by deal
	Competitive activity	Budgets for sales promotion by activity
2125	Package Development	
	Program and expenditures	Programs, schedules, and budgets based on new packaging requirements - deals, legal restrictions, weight change, cost reduction, etc.
	Effectiveness	Objectives in terms of product characteristics, name, consumer appeal, etc.

Exhibit 13
Page 4

ACCOUNTING	REPORTING	REPORT FILE NO.	REPORT FREQUENCY
Actual trade and consumer promotion expenses by deal Sales promotion expenses by activity	Actual trade and consumer promotion expenditures and variance from budget by product by deal (Advertising Accounting Report)	2124.1	Monthly
Sales volume, product distribution, and market share for deal period and selected control period where possible Field reports of competitive deal and sales promotional activities	Sales promotion results, expenses and variance from budget by activity (Advertising Accounting and Sales Promotion Department reports)	2124.2	Monthly
	Consumer and trade promotion costs and related results such as increased share, increased distribution, and/or increased volume for promotional period compared to a selected control period (prepared by District Office)	2124.3	As Required
	Summaries of competitive promotions and deals (prepared by Sales Coverage Department)	2124.4	As Required
Status and expenditures by product and by job Tests determining consumer reaction to significant design recommendations	Status of projects in progress and actual expenditures compared to plan - by job and in total (Package Development Department report)	2125.1	Quarterly
	Test results measuring design effectiveness related to objectives (Commercial Research Department report)	2125.2	As Required

GROCERY PRODUCTS AND FEED COMPANY

PLAN FOR MANAGEMENT INFORMATION-CONTROL SYSTEM
MARKETING AND DISTRIBUTION OPERATIONS
GROCERY PRODUCTS

AREA NUMBER	MAJOR CONTROL AREAS	PLANNING
2126	Total Advertising and Promotion	
	Program and expenditures	A & M budgets of expenses by product by account
	Departmental expenses Manning Expenses	Manning tables and budgets based on work loads
2127	Pricing	
	Pricing reviews and decisions	Prices established to provide maximum direct profit contribution considering effect of price changes on volume and net margins
	Price trends	
	Competitive price position	

Exhibit 13
Page 5

Mktg. & Dist. Op.
Groc. Prods.

ACCOUNTING	REPORTING	REPORT FILE NO.	REPORT FREQUENCY
Actual expenditures distributed to proper accounts Number of employees	Actual A & M expenditures and variations from plan (Advertising Accounting report)	2126.1	Monthly
	Actual departmental expenses and variations from budgets, actual number of employees compared to plan (Controller's Department report)	2126.2	Monthly
Sales volume and direct profit contribution by product Fixed expense by product Market share data and competitive price information	Analyses showing anticipated and actual effect of price changes on market share, volume, direct profit contribution, and net profit by product (report not yet developed)	2127.1	Annual and As Required
	Charts by product packing of product costs, list prices, retail shelf prices, and retail mark up on costs, by geographical area (Product Management maintains a record)	2127.2	Annual
	Competitive list price, retail shelf prices, and retail mark up on costs, by product packing (Sales Services Department report)	2127.3	Annual and As Required

Exhibit 14
Page 1

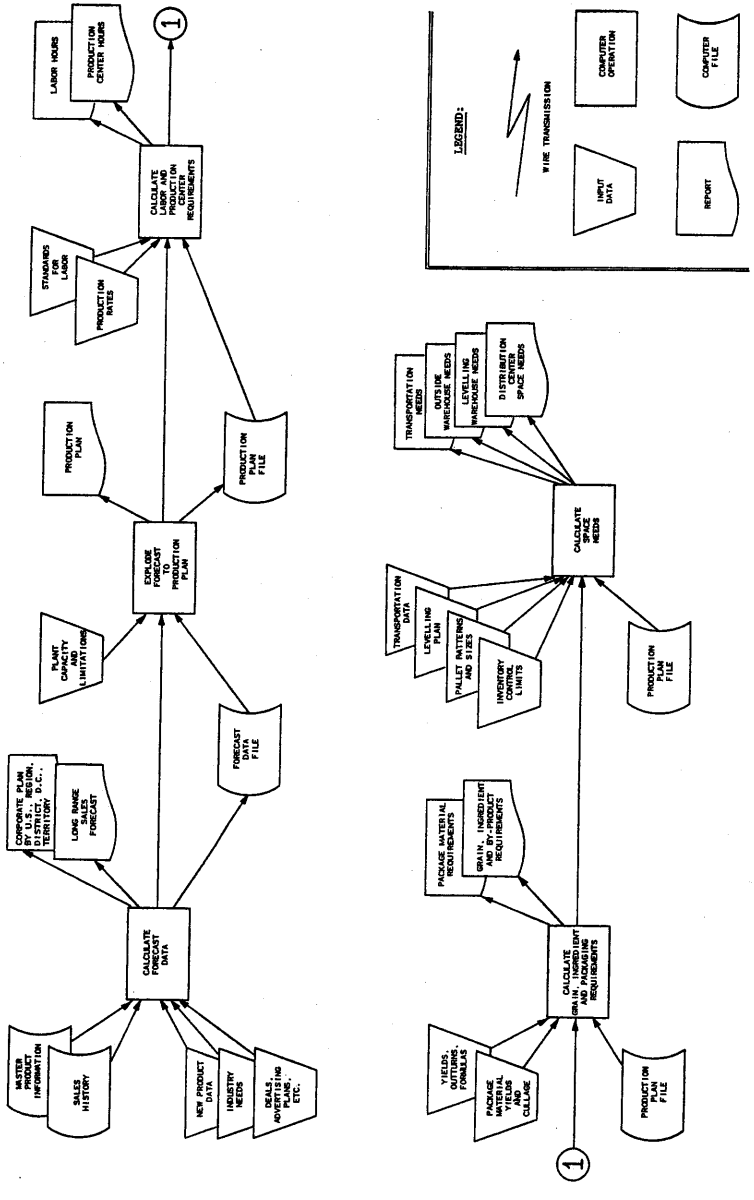


Exhibit 14
Page 2

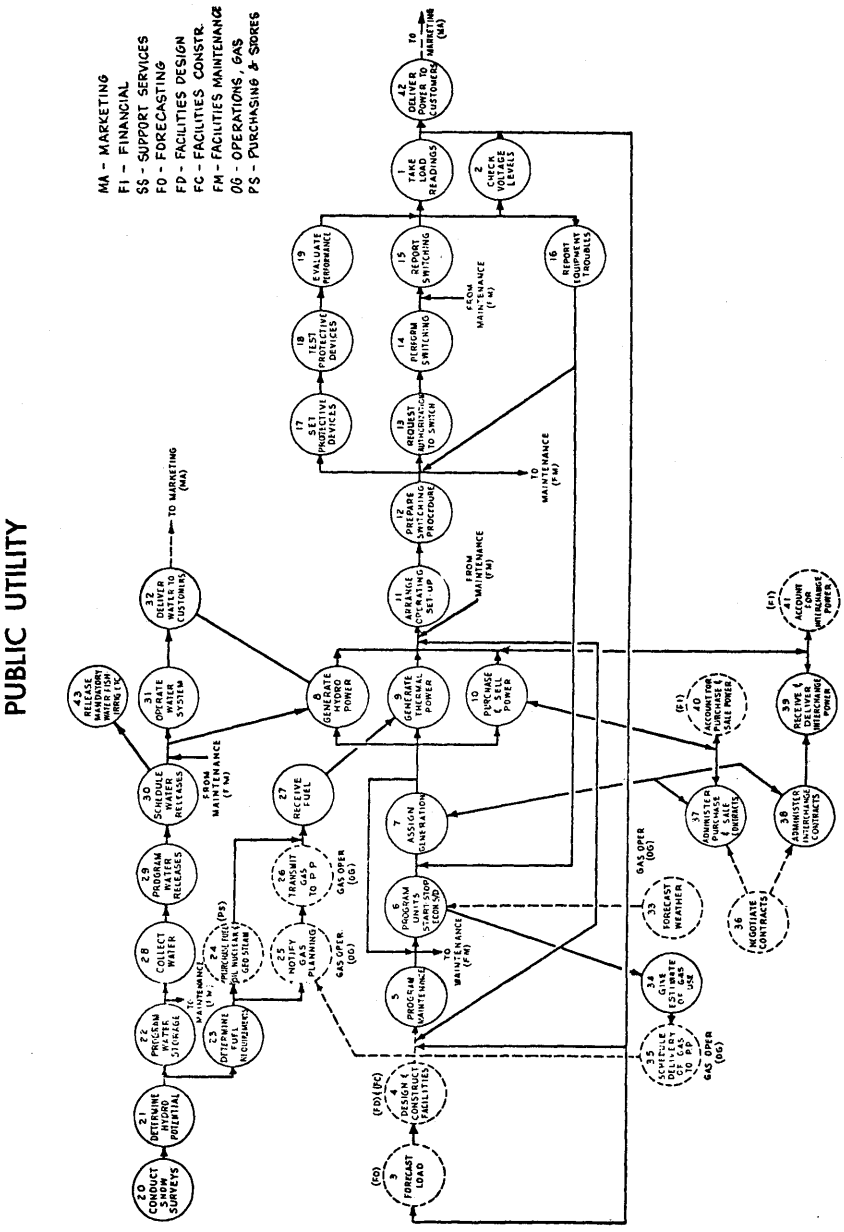


Exhibit 15

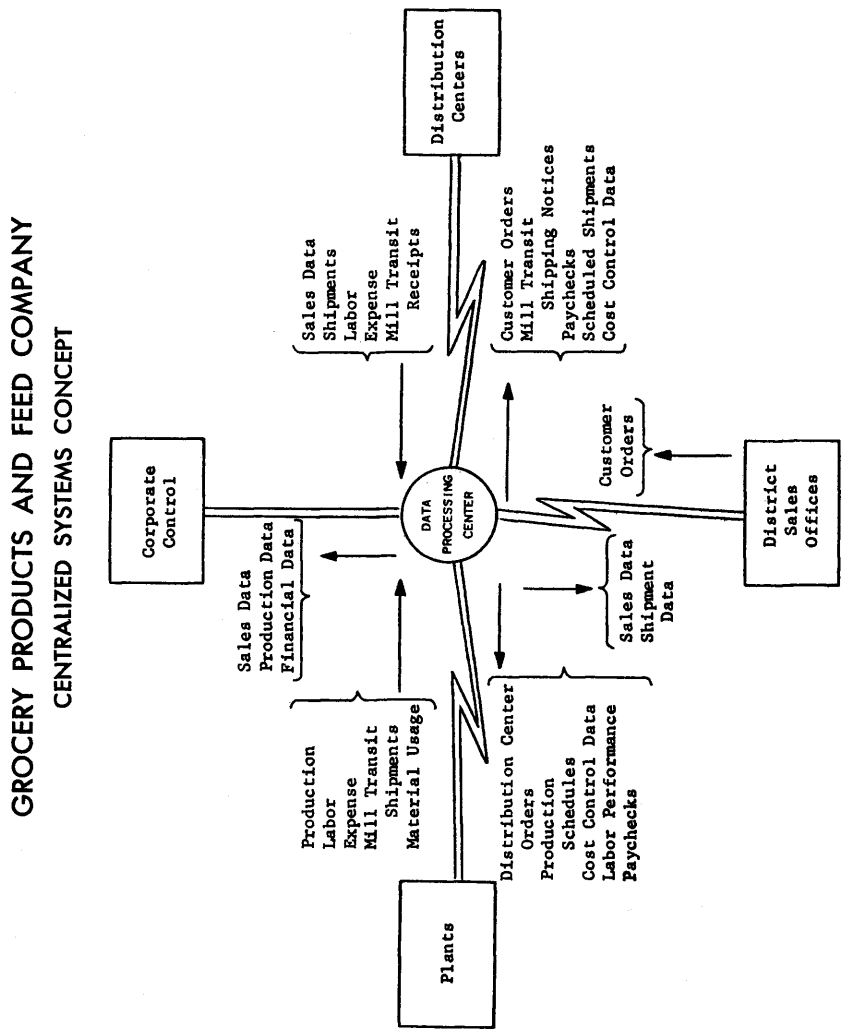

GROCERY PRODUCTS AND FEED COMPANY
CENTRALIZED SYSTEMS CONCEPT
Corporate Control
Distribution Centers
Plants
District Sales Offices
DATA PROCESSING CENTER
Sales Data
Shipments
Labor
Expense
Mill Transit
Receipts
Customer Orders
Mill Transit
Shipping Notices
Paychecks
Scheduled Shipments
Cost Control Data
Customer Orders
Sales Data
Production Data
Financial Data
Production
Labor
Expense
Mill Transit
Shipments
Material Usage
Distribution Center
Orders
Production
Schedules
Cost Control Data
Labor Performance
Paychecks
Sales Data
Shipment
Data

Exhibit 16

GROCERY PRODUCTS AND FEED COMPANY

REPRESENTATIVE COMMUNICATIONS NETWORK SHOWING POINTS OF SUBSTANTIAL DATA FLOW

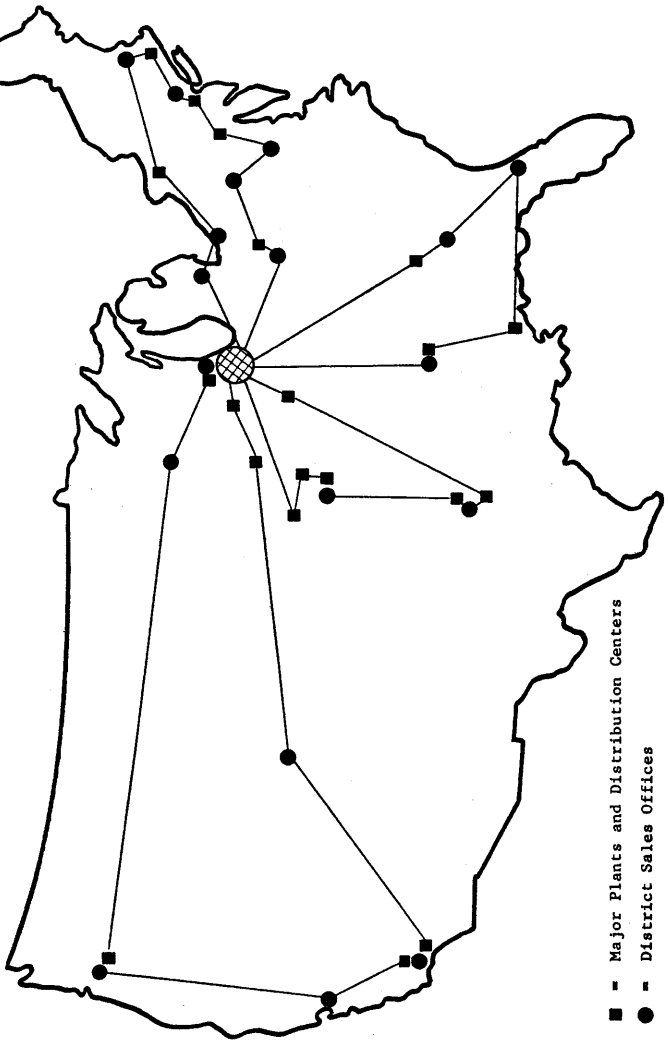
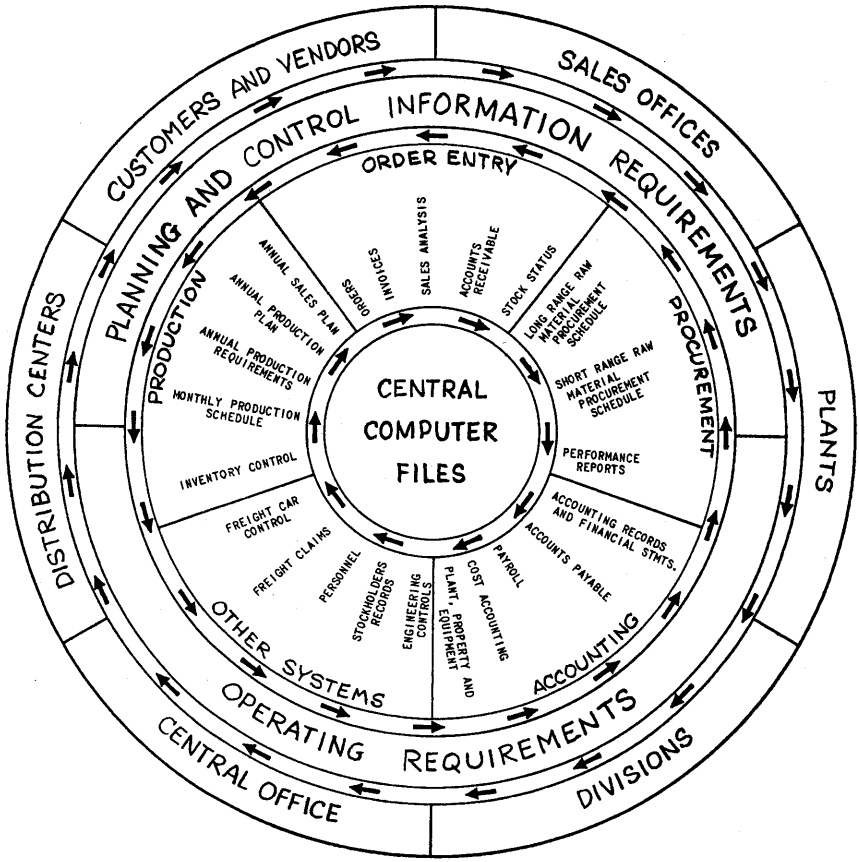


Exhibit 17

GROCERY PRODUCTS AND FEED COMPANY

MANAGEMENT INFORMATION SYSTEM
CONCEPTUAL DESIGN CHART



GROCERY PRODUCTS AND FEED COMPANY

PRODUCTION

MAJOR SEGMENT	SUB SEGMENT	PRIMARY INPUT	INPUT SOURCE: SALES OFFICES	INPUT SOURCE: CUSTOMERS & VENDORS	INPUT SOURCE: DISTRIBUTION CENTERS	INPUT SOURCE: PLANTS	INPUT SOURCE: CENTRAL OFFICE	INPUT SOURCE: DIVISIONS	CENTRAL COMPUTER FILES	PRIMARY OUTPUT	OUTPUT DESTINATION: SALES OFFICES	OUTPUT DESTINATION: CUSTOMERS & VENDORS	OUTPUT DESTINATION: DISTRIBUTION CENTERS	OUTPUT DESTINATION: PLANTS	OUTPUT DESTINATION: CENTRAL OFFICE	OUTPUT DESTINATION: DIVISIONS	DESCRIPTION
Production	Annual Sales Plan	Trends Deals new products					X	X	OPEN CUSTOMER ORDERS FINISHED GOODS INVENTORY RAW MATERIALS INVENTORY CUSTOMER DATA SHIPMENTS ACCOUNTS RECEIVABLE SALES PLAN PRODUCTION PLAN PRODUCTION SCHEDULE VENDOR DATA PURCHASE ORDERS PROCUREMENT SCHEDULE ACCOUNTS PAYABLE PAYROLL DATA PERSONNEL DATA FORECAST DATA CONTRACT DATA FREIGHT CAR DATA PRODUCT COST STANDARD TRANSIT BILL INVENTORY MANUFACTURING EXPENSE G & A EXPENSE A & M EXPENSE R & D EXPENSE PLANT, PROPERTY, AND EQUIPMENT DEPRECIATION DATA CASH OTHER ACCOUNTING DATA	Sales forecast Annual Sales Plan Plan by product, territory, D.C.			X		X X X	X X X	The computer generated forecast is checked by appropriate management and manual corrections are entered into the system. The computer then develops a sales plan by U.S. Total and by product, territory and Distribution Center.
	Annual Productbn Plan	Reassigned Product Sources					X	X		Annual Production Plan			X	X	X	X	The Sales Plan above is distributed by the computer to the normal producing plants. Corrections are made by Production Management, and final plan is issued.
	Annual Production Requirements	Production rates, yields capacities, cullages leveling etc.			X	X	X	X		Production Center requirements Grain Ingredient needs Package Material needs Warehouse needs Manpower needs				X X X X X	X X X X X	X X X X X	The Production Plan above is multiplied by standard rates, yields, etc. to determine needs of men, material and space. These requirements are reviewed by Production Management, and changes are entered into the computer prior to final calculation and reporting.
	Monthly Production Schedule	New products and deals Yields, out-turns formulas etc.			X	X	X X	X		Short Range Forecast Schedule Package Line Requirements Raw material Requirements			X	X X X	X X X	X X X	A short-range forecast is made by the computer by week for the next two months and by month for the next year. This after review is then exploded to detailed production schedules by plant and by specific requirements.
	Inventory Control									Mill Transit Orders			X	X	X	X	Inventory levels for future periods are determined by forecasts, plans, sales and stock status. New levels are calculated and mill transit orders are issued from the computer for review by production management.

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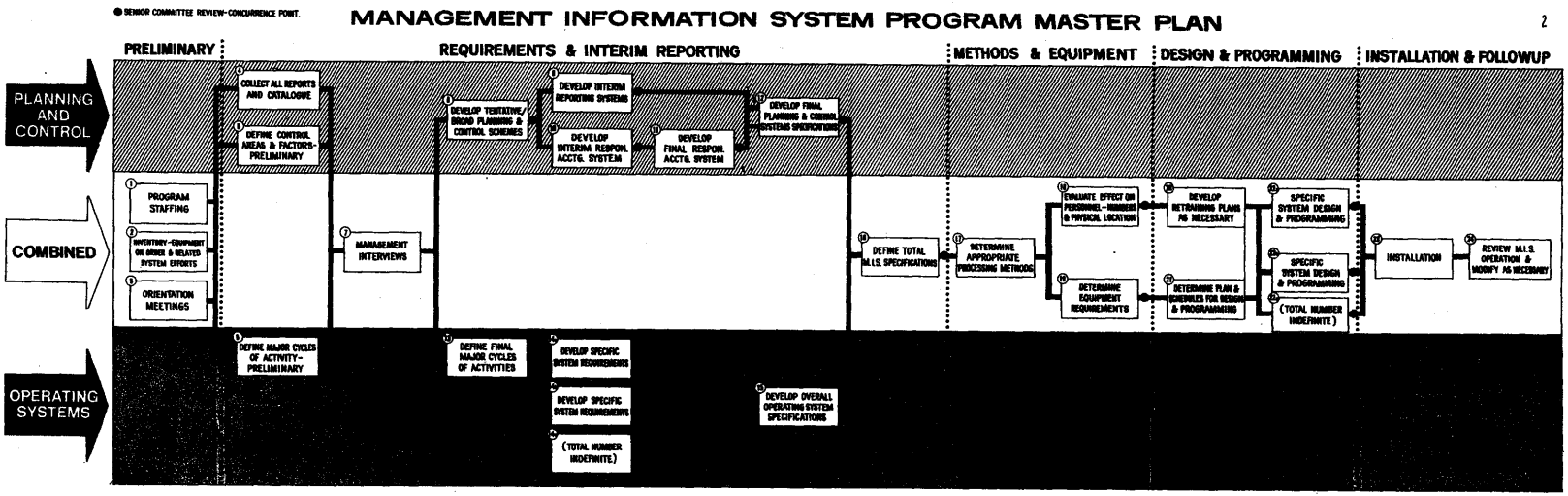

Exhibit 19

serve the operating systems, and others relate to both, as shown by the three horizontal bands running across the chart. Actual events do not in practice proceed exactly in the sequence shown, but it is fundamental to the approach that requirements are defined and reduced to system specifications—step 16—before final methods and equipment decisions are made.

A major point in my thesis regarding management information systems is that it is not a technique per se or a collection of techniques, but rather that it represents a structure and modus operandi for ordering the affairs of a business. In my view, nothing approaching what might be realistically termed a total system will be achieved without first pursuing requirements throughout every aspect of the operation. The result of this process is a structure that specifies how theses requirements are to be met and that extends to identifying all the interactions taking place in the conduct of the business. Forecasting, scheduling, PERT and PERT cost, responsibility accounting, direct costing, inventory and other decision rules, and all manner of techniques are selected, slotted into the structure, and built into the final system. Some people start with hardware, some with the application of intriguing techniques, some with reports; and there are all manner of other approaches. But, I suggest you start at the top, think broad, work deep, and structure the problem before you attempt to solve it in any aspect or detail.

IMPLICATIONS

There is, of course, much speculation going on concerning the implications of this level of system on organizational structure and the way companies will be managed in the 1970s and beyond. I will mention but a few, and only briefly.

Management Involvement

First, I think you can see that building an effective system of this level can only be delegated within limits. The heavy orientation toward requirements implies that the top people running the show have to say how they want to run it. But getting this involvement by people at top level doesn't come easily or naturally. To the extent that they don't recognize this as a completely new adventure—significantly different from the last time around when the EDP guy proceeded to mechanize, application by application, what was essentially already going on—the

company is going to wind up with larger computers and a lot of leased lines and very little, if any, better management or increased profits.

The approach I advocate requires some introspection by general management, as well as an objective look by those down the line, at every job, function, and the total company to a degree never before undertaken. You know that people moving into top positions, in the normal course of events, find it very difficult to reassess the situation in which they find themselves. Every position has its traditional information and communication characteristics. A man moves into the corner office and finds himself in a stream already flowing at a rapid rate, with built-in pressures, priorities, and crises. There isn't much time to gaze out the window and speculate on how you would do it if you could do it all over again. But, in this game we are discussing, that is exactly what is required. How would you really do it if you were starting all over?

The point being made is that an effort of this scope, importance, and cost requires both attention and direct involvement of the highest echelon of management. Top management often does not have sufficient understanding of the intricacies of electronic data processing systems techniques. Systems technicians, on the other hand, usually do not understand the management art. Unless the top officers directly participate in defining requirements for the system, the result may satisfy the technician, but fail to make the potential contribution to management effectiveness.

Past experience clearly shows that the degree of success in operation of electronic data processing systems is directly related to the degree of management participation in their development. In the future this factor will be even more critical.

Participation by senior executives obviously requires significant amounts of their time. But more significant are shifts in their perspectives that are likely to result from introspective analysis of their own and their subordinates' jobs and the job relationships within the structure. It should be expected that no matter how the system ultimately develops, executives will apply different priorities and standards of relevance to the various elements of their responsibility.

How Much Information How Soon

In the past, the scope of management's view of their informational needs was conditioned by limitations in the data processing techniques

available. Now that these techniques have so expanded, prior limitations no longer apply and emphasis is shifting to a more careful identification and definition of requirements for operating a business. What are the decisions that must be made? How will they affect over-all results? What information is pertinent to these decisions? What are the critical time factors? Today, given a broad capability for processing data, those who define requirements for business information can proceed with fewer inhibitions, consider a higher degree of quantification and establishment of mathematical relationships, and in most cases confidently adopt a more scientific approach to their operations.

The fact that there need be fewer inhibitions leads some to want to forgo the onerous chore of requirements definition. This point of view is expressed as, "Now I will be able to have whatever information I want whenever I want it." They become intrigued with the on-line, real-time possibilities and visualize themselves sitting in front of a TV-like device having an ability to call up whatever they want to know about almost anything and to see almost everything that's happening in the business, while it happens.

I was taught that the higher the position in the business structure, the greater the concern for strategy than for tactics. Where are we going to be next year? in three years? in five? And strategies are more a matter of trends and cycles reflected in data covering periods longer than the moment. I shouldn't think that the chief executive would want to feel every bump in the road through the seat of his pants. Rather, he should seek to remove himself from the immediate stream of events the better to maintain his perspective in considering the strategic factors in the business. To me, a greater quantity of information produced more quickly represents a fallacy as compared with more-relevant information on matters that really count covering time periods that are truly significant.

The man directly concerned with a logistical system, such as that providing for the immediate flow of orders or goods, needs sensing devices to make moment-by-moment decisions. The top management shouldn't be wired into such logistical streams, yet this is what some managers seem to want.

Responsibility for the Information Function

The initiative for developing and applying this more sophisticated level of information technology may come from the chief executive of-

ficer, the head of a functional group, such as marketing or production or the financial officer. In the past, when systems were of limited scope, it was the financial officer who most frequently took the initiative, and the first applications usually served accounting needs. Production, marketing, and personnel applications would then be added to some degree in due course.

In the days when punched card tabulating systems represented the top degree of sophistication, the approach just described was almost universally accepted as a normal course of events. As the first and second generations of computer systems came on the scene, we saw in a few companies a shift in the assigned responsibility for such systems to production, marketing, or to newly established functions. Some observers who have been assessing the achievements attained through computer systems conclude that where the potential has not been realized, it is because the system was oriented too much toward accounting, because the computer was misused as a large-scale bookkeeping device, and because the financial officer frequently has too narrow an outlook. There is little question that this has been so in many instances, but whether it is valid to conclude that financial officers should generally not have jurisdiction over such systems is a question still unresolved.

Traditionally, it has been the financial officer, in addition to the chief executive, whose position had an overview of corporate affairs. His position epitomized the concept of functional control because it required him to exercise authority over the policy and procedural aspects of accounting-related records, wherever they were maintained in the company, and this extended to an internal audit responsibility over such records.

Nowadays, with increasing frequency we observe a new function emerging—the information function. We see vice presidents for information systems, vice presidents for administration, directors of planning, and a proliferation of titles applied to positions concerned with matters of an accounting nature, yet established separate and apart from the financial function. These positions vary in scope and may cover systems development and maintenance or extend to actual operation of the information system, including the equipment; and inevitably this function extends to interpretation of results. An integrated information system, of course, includes all the accounting records as well as other data, yet such positions are seldom headed by accountants. Frequently these

executives are computer specialists with backgrounds in any one of a variety of disciplines—engineering, mathematics, or the behavioral sciences. The growing tendency is to identify them all as information specialists.

This trend has been taking shape for some time, and its pace is accelerating. The more this new breed of information technicians becomes established, the more the financial officer's traditional role will be eroded. Some financial executives seem scarcely aware of what is happening, others accept the trend as inevitable or perhaps feel inadequate to cope with it, and others offer strong and sometimes successful resistance. In any event, the financial officer has much at risk, and while he may assert his "right" to this function, "right" has little to do with it. Where the financial officer ultimately ends up is going to depend primarily on the individual. Does he take the initiative, hold a broad view, and demonstrate that the company's total interest will best be served by putting him in charge of the information function?

Co-ordinated Decision-Making

Information technology at this level can be expected to affect not only the quality of decision-making, but the place in the organization structure where various decisions are made. Management decision-making today is for the most part significantly fragmented. Separate decisions are made throughout the organization structure on specific subjects that in the aggregate have their effects on broader matters. Each individual decision-maker seeks the information necessary to make his limited decision. Organization structures are built on the theory of the specialization of individuals and compartmentation of functions. Information systems have been built in response to this type of structure.

However, now that it is practicable to provide one person in one position with total information on a broader question—information that is accurate, timely, and carefully selected for relevancy—we may have fewer decision-makers and better decisions. Consider for a moment a fundamental problem: How much of what to manufacture, and when? This involves a complex of decisions by persons with interests in sales, procurement, personnel, production, warehousing, traffic, and probably other functions. Under today's highly compartmented organization structure and fragmented decision-making, there is no guarantee that the

myriad separate decisions will in the aggregate produce the best final decision on the broader question.

Centralized data processing does not necessarily require a centralization of decision-making and does not necessarily result in it. But, if the total information to make a broad decision is altogether at one place, it seems illogical to communicate it, in segments, to several persons for purposes of making only limited decisions. The organizational implications of centralized data processing point to a broadening of the span of control assigned to any one position and fewer echelons in the over-all structure.

CONCLUSION

My purpose here today has been to trace the evolution of management information systems as I have seen it over the past 15 years or so. Sometimes looking back where you have been gives a better understanding of where you are and a better perspective on the future. We saw what was defined as management reporting in 1950 evolve into planning and control systems and then into profit planning structures that have become quite highly developed.

Now, with the new generations of computer equipment and advances in communication capability, systems may be built without regard to the inhibitions of the past. In fact, unless broad and sophisticated systems are conceived, the potential of today's equipment will not be realized and capacity will be paid for that is not utilized.

The 1970-model system thrusts—both broad and deep—into a business' affairs and poses implications concerning how businesses will be managed that are only now beginning to emerge and be identified.

The art of management was once defined as "making irrevocable decisions based on incomplete, inaccurate, and obsolete information." The purpose of business information is to narrow the areas of uncertainty in decision-making. Information technology comprehends the determination of that information pertinent and relevant to management of an enterprise and then provides it more completely, accurately, and currently.